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VIEWS, NEWS AND INTERVIEWS.

While cutting electric light wires on poles in Belleville avenue, Newark, N. J., one night last week, Josiah V. Gove, aged 27 years, received a shock which threw him to the ground, fracturing his skull and killing him instantly. An unknown man, who was coiling down the heavy copper wire in a wagon, got down when he saw his companion fall, and after securing his watch drove rapidly away. The police are convinced that the men were stealing live electric light wires. They had secured 180 feet of wire when Gove fell.

An electrical ice-cutting machine is in successful operation on Horseshoe Pond, near Concord, N. H.

Don't indulge the somewhat common delusion that when you die, knowledge of the electric art will die with you; Faraday, Henry and several others are dead.—*The Station.*

Within the city limits and near them there is in use a method of heating street cars which would be appropriate in Wayback, but seems somewhat out of place in the metropolis, says the New York *Sun*. It is used on the street car route connecting City Island with Bartow, a route very much overcrowded in Summer and very little used in Winter. The cars have to be run all the year round or the company would lose its charter. No provision was made in the building of the cars—they are gems of antiquity—for the introduction of stoves or any other means of keeping the passengers from freezing; so the company, in a spirit of kindliness, has put oil stoves into the vehicles. Each car has its own little stove set down in the middle of the floor. Around the stove the passengers gather, and they are expected to give it such care as is needed. Sometimes it happens that there are no passengers, in which case the driver, who is also conductor, takes the stove out on the platform and sits on it for warmth. One cold day recently a party of three men were the sole occupants of the car. On the way to City Island they disembarked quietly; so quietly that the conductor didn't notice their departure. He did notice, however, on his arrival at the terminus, that the oil stove was missing, and he concluded that he would have to settle for it. But on the return trip he found the stove standing in the middle of the track near a cross road, and on it a piece of paper, held down with a stone. The writing on the paper read:

"Being obliged to wait here for a delayed conveyance, we took the liberty of borrowing the company's oil stove. Enclosed find balm for the wear and tear upon your anxiety."

The paper contained a half dollar.

A man in Brooklyn, N. Y., says that he notices an increasing use of the word *telefoam* for *telephone* and wants to know why this is thus.

Long-Distance Telephony Abroad.

A new telephone line is to be established between London and Berlin—and then it will be an easy matter for Queen Victoria to hold daily conversations with her grandson, the Emperor of Germany.

The telephone line between London and Paris has been such a success that it is proposed to lay another cable, which will make four circuits in all.

Welsbach Burners.

TO THE EDITOR OF ELECTRICAL REVIEW:

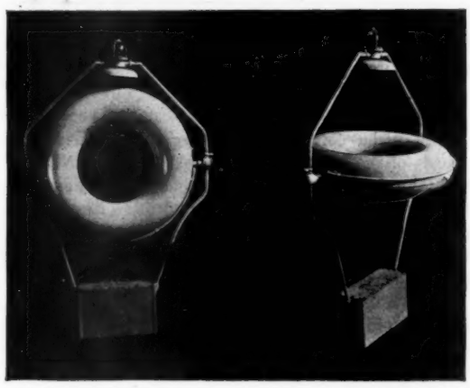
On reading your February 5 issue I find the enclosed paragraph:

"Do you see that blamed Welsbach light in my show-window?" inquired a Columbus avenue shopkeeper of a customer. "Well, every night for the past week, when I have lighted it, 'click' goes the chimney and breaks. Costs me 10 cents every time that happens. Besides, every time the burner gets a sudden jar, smash goes the mantle. That costs me 50 cents. Oh, it's a great light!"

This has been the experience of most users of that burner.

Yours truly,
J. C. CHURCHILL.

Meriden, Ct., February 5.



FIGS. 1 AND 2.—AN ELECTRIC-LIGHTED LIFE-SAVING BUOY.

Interior Conduit and Insulation Company.

At a recent meeting of the directors of the Interior Conduit and Insulation Company, 527 West Thirty-fourth street, New York, the following officers were elected for the ensuing year: Edward H. Johnson, president; Allan C. Bakewell, vice-president; Charles P. Geddes, secretary and treasurer.

The developed power that is in use, and will be used, during this year, from the Niagara river, is estimated at 29,226 horse-power.

ELECTRIC-LIGHTED LIFE BUOYS.

BY JAMES H. BATES.

Several styles of Guest-Bates electrically-lighted marine life-saving apparatus are now being devised, but I shall describe now only one at present in the market. One of these, of large size, with a surplus of buoyancy, battery and lamp power of special design for a special purpose, was tested on board of the "Armeria," a lighthouse tender, in June, 1894. Commander West, U. S. N., supervised this trial and reported very favorably on the buoy to the Lighthouse Board at Washington. The type of buoy tested consists of a ring mounted in a frame-work of metal tubing, as shown in the accompanying illustrations. The ring of the buoy is normally in the plane of the frame; when the buoy is dropped into the water, the ring on which the buoy floats turns so as to rest on its side on the water, and on so turning operates an automatic switch controlling the lights in the manner described below. At the lower end of the frame is the battery box containing the cells. To keep this perfectly dry inside, a moisture absorber is placed there with the cells. The box cover is easily removable and made water-tight by a packing of rubber with wax or tar. The frame work passes from the ends of the battery box upward, meeting to form an arch over the ring. On top of this arch is the lantern, a glass globe covering one or more pairs of incandescent lamps. Electrical connection between these lamps and the battery cells are through the tubes of the framework on both sides. On each side of the frame is a switch box containing the automatic switch controlling the circuit. The ring is mounted upon trunnions journaled in the switch boxes. Where the trunnion enters the switch box it is surrounded by a water-tight stuffing box to better protect the switch. The stationary contacts of the switch are secured to the frame and box, the movable contacts are secured to the ring trunnions, but, of course, both sets of contacts are insulated from their

supports. The contacts are so related to each other that the turning of the ring but a very small angle out of the plane of the frame will close the circuit and the lamps, which will remain in circuit and lighted until the ring can be turned around nearly one complete revolution. This precaution is very important because it will ensure the continuous glow of the lamps in a rough sea.

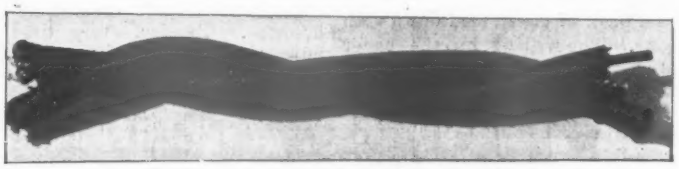
Such are the principal features of the machine. There are a few other interesting details added. One is a hand switch concentric with the lantern added merely by way of precaution; it is so arranged as to be able to switch on one pair of lamps at a time, or turn off all of them. The lamps are in parallel; they are used two at a time to economize battery power; if one lamp of any given pair of lamps has a filament break, the other can supplement it until another pair of lamps can be switched on. Another addition is a bell below the lantern, automatic or other, which will be of value as a fog signal. The handle of the hand switch is surrounded by a water-tight stuffing box like that of the automatic switch.

A very interesting problem is that of battery power. The lamps for such will be from three to eight volts—from one-half to eight or more candle-power—and in every case will take about one ampere of current. The improvements in dry batteries of late years have been so great that the market can now furnish cells, of which six, in multiple series of three, can glow continuously a couple of one candle-power lamps one hour. Connected in the same way, 18 such cells can glow these lamps three hours, and 36 of them can glow the same lamps six hours; more hours can be gotten by adding cells, but the latter case will be amply sufficient for most work. It will be of value in the lake region on sailing vessels which are there so numerous, because such a buoy will require no more attention than the present cork ring, since its cells will be perfectly good until used and easily and cheaply replaced when once used.

For sailing vessels along the coast, or any vessel from which the access to a dynamo or other means of charging batteries is not easy, this apparatus will meet every probable demand for a life buoy. For lamps of large candle-power for use a longer time, a storage battery is at present recommended, especially to those having easy access to a dynamo, to charge them up every two or three months. Accumulators are now so well made that they will lose but 20 per cent of their charge by standing in a place kept dry as the buoy battery box will be. Hence, on a steamer, which almost always has its dynamo, the care of cells is an easy matter. The writer is now designing a salt-water battery of such power that it will glow a strong light for several whole nights continuously, when overboard, its capacity being large without occupying much room or using much weight of metal therein, at the same time being always ready for use and perfectly reliable without requiring any attention.

This subject is so large that no justice can be done to it in this short article, which will attempt to indicate merely a valuable line. The field being new, Mr. Guest and the writer were able to obtain patents in the United States and Great Britain of sufficient breadth to control the means of lighting this field, in which are not only portable buoys, but life boats and life rafts as well. The buoy lighting will be given most attention first, but the boat and raft problem will be easily handled, for all these require only very simple apparatus. The reason that the Guest-Bates patents control the electric lighting of marine life-saving apparatus is due to the simple fact that for such work precautions of no importance in ordinary portable lighting plants are of vital necessity here. The issued patents are strengthened by pending cases.

This article deals only with the buoy, with but incidental references to other work. The inventors have developed interesting means for dropping the buoy overboard in an inappreciable short time, but as a rule the matter of placing the buoy for quick use will be left to the owners or officers of the vessel. The best means of hanging the machine for prompt use will be but a pair of spring tongs held shut by a ring over the handles; by a jerk of an attached rope this ring is pulled off and the buoy is let drop all "in a twinkle." This device is that of an old civil engineer, Mr. C. J. Bates, who is now treasurer of the Guest-Bates Marine Life-Saving Appliances Company, of New York city.



A Section of the Twisted Pair No. 16 Conductor, Forming the Telephone Line From the Steamship "St. Paul" to Long Branch, N. J.—Reproduction Exact Size.

Frederick S. Pearson, chief engineer of the Metropolitan Traction Company, of New York city, in a statement before the commissioners appointed by the Supreme Court to take testimony for the proposed rapid transit road, gave some figures in connection with the property not hitherto published. He said that the cost of cars and motive power is estimated at $7,000,000. He fixed the cost of the car houses and feeders necessary to operate the proposed roads at $8,000,000. He said that 500,000 people are daily carried over the roads operated by the Metropolitan Traction.

The report of the Edison Electric Illuminating Company of Boston for the year ending December 31, 1895, shows gross earnings of $709,002 and a net income of $252,701.

The "St. Paul"-Long Branch Telephone Line.

The Electrical Review has already told the story of how the stranded American liner, "St. Paul," was connected with the long-distance telephone system of the country while she lay embedded in the sands off Long Branch, N. J. The importance and value of this promptly executed idea is emphasized by the fact that for the 10 days after the telephone line was installed until the ship was floated the line was in constant use day and night. At no time was conversation even temporarily interrupted, although during the heavy northeast storm of the night before the "St. Paul" was hauled off there were exciting times aboard the ship, while efforts were being made to save the insulated conductor from breaking as the ship rolled and tossed on the heavy ground swells.

Great credit is due to the staff of the New York & New Jersey Telephone Company for the work they did on this occasion. Mr. W. D. Martin, manager of the company's Long Branch exchange, had already demonstrated his ability as an intelligent and cool-headed man in an emergency. During the disastrous fire at Seabright, N. J., in June, 1891, when over 400 houses were burned, Martin was a lineman in the employ of the New York & New Jersey Telephone Company. It soon became apparent that the local fire department was unable to cope with the conflagration. Without waiting for orders from any one, Martin grabbed his testing set and ran to the nearest pole, which was then ablaze. Quickly climbing it, he cut in his testing set and summoned the fire departments from Long Branch and Asbury Park. The result of this heroic act was that a large part of the town, which would otherwise have been burned, was saved. So, when the "St. Paul" went ashore at Long Branch, it was Martin, who had since been promoted to local manager, who realized the importance of keeping the ship in constant and instantaneous connection with the shore. The trick was soon accomplished and, although the work was hastily done, it served its purpose well.

The line ran from a 30-foot pole on a bulkhead on the beach through a pulley at the foremasthead of the "St. Paul" and then down below decks where it was connected with a long-distance telephone set. The shore end of the line was connected with the Long Branch exchange. Frederick Reilly, one of the telephone company's Long Branch linemen, was put in charge of the instrument on the ship. He is an intelligent and witty Irishman, and his faithfulness to his novel and often trying duties earned him much praise. He got but very little sleep during his 10 days' vigil, as the line was in almost constant use transmitting messages from the ship to New York and Philadelphia. The telephone was put on the "St. Paul" first, for the use of the ship, and secondly, to send news to the daily papers. The newspaper men have dubbed Reilly "Commodore," a nickname that will probably cling to him.

While the ship lay easy in her bed of sand and the wreckers were waiting for a northeast wind and sea to help them get her off, it was comparatively easy work to keep the telephone line intact. Whenever the wreckers moved her a few feet out to sea, some of the slack wire coiled up on deck was eased off. This was done as often as she moved. There were 1,200 feet of conductor between ship and shore. When the northeast storm finally came it was a good one and suited the wreckers to a dot. But it made lively work for Reilly. Snow and hail coated the wire and the added weight ate up the slack alarmingly fast. Besides, the "St. Paul" was being pulled out of the sand by the wreckers and that also used up the slack wire rapidly.

Along in the early hours of the morning Reilly asked for help and the officers of the ship assigned two sailors to assist him. These men were stationed on deck, and as the ship lurched off shore the slack was sent out on the run. When she heeled over again toward the beach, Reilly and his two helpers hauled in the slack again to keep the line out of the tide which runs so swiftly along that shore. All the time the span of wire between the ship and the land was getting longer, the coating of ice was getting heavier and the work of keeping the wire out of the water was growing more difficult.

Conversation with the land was kept up until six o'clock in the morning, about three hours before the "St. Paul" was floated. At that time the slack was nearly spent and the wire was heavy with ice. Suddenly the ship lurched seaward, the line fetched up taut as a fiddle-string, vibrated in the air for a minute—and snapped. The break was found at the masthead where the ice had firmly jammed the wire in the pulley. Reilly's work was finished.

The Electrical Review has secured a piece of the insulated conductor used to connect the "St. Paul" with the land. It is shown full size in the accompanying illustration. The technical name of it is "No. 16 B. W. G. hard-drawn copper, braided, twisted in pairs." The insulation over the tinned copper is $\frac{5}{32}$ of an inch thick and this is covered with the braid. The wire was made by the Safety Insulated Wire and Cable Company, of New York city, and is a part of 800 miles which they have furnished to the New York & New Jersey Telephone Company. The wire is chiefly used by many telephone companies for distribution purposes from poles across streets and for overhead work where two separate wires would be objectionable. Mr. Martin had a stock of this wire on hand at Long Branch and naturally used it on the "St. Paul" line. It certainly did its work well under very trying circumstances.

ELECTRICITY ON THE BROOKLYN BRIDGE.

A SUCCESSFUL TEST WITNESSED ON SATURDAY OF LAST WEEK.

The first official exhibition of electricity as applied to the switching of the cars on the Brooklyn Bridge was made February 8, at 11 A. M., in the presence of President Howell, Vice-President J. Seaver Page and Trustees Keeney and Henriques. The motor car was coupled to three of the ordinary passenger cars and the complete train of four cars was switched by the motors from the incoming to the outgoing platforms and thence to the cable sheaves several times. The car was then taken over the complete bridge circuit twice. Much satisfaction was expressed by the president and trustees and by Chief Engineer C. C. Martin at the manner in which the work was performed. It is the intention to use the electric power for switching at either end, and in case of accident to the cable the power will be instantly available for running the cars across the bridge. The puffing little engines on the bridge will soon be disposed of to make room for their cleaner and more modern competitor, the electric motor.

In addition to the trustees named the test was witnessed by ex-Mayor Charles A. Schieren, H. M. Littell, Elisha Dyer, Jr., E. R. Knowles, and by the following representatives of the General Electric Company: Messrs. W. J. Clark, A. K. Baylor, John McGhie, F. Gilbert, R. H. Beach and C. B. Martin, the last-named gentleman being in charge of the installation. Messrs. Charles W. Price, of the ELECTRICAL REVIEW; W. F. Osborne, of the *Western Electrician*, and E. E. Higgins, of the *Street Railway Journal*, represented the technical press. Messrs. F. B. Scott and F. H. Sheppard, of the Baltimore & Ohio Railroad, were also present.

FIG. 1.—BROOKLYN BRIDGE TRAIN EQUIPPED WITH ELECTRICAL POWER—SHOWING METHOD OF CONTROLLING, AND COLLECTOR ON TOP OF BOTH ENDS OF CAR.

Car No. 76, one of the regular passenger cars of the Brooklyn Bridge, was selected to receive the first electrical equipment. All the apparatus, with the exception of the controlling handles and circuit breakers, are placed out of sight beneath the floor of the car. The ordinary light Pullman trucks on which it has hitherto run and the cable grip mechanism were removed. Heavier trucks were necessary to carry the motors.

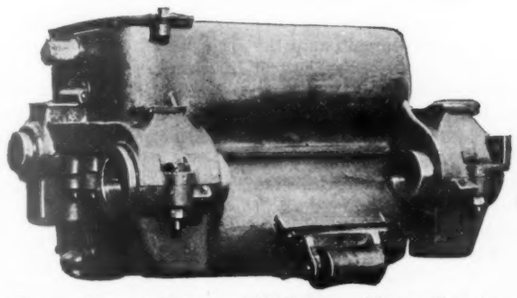


FIG. 2.—GENERAL ELECTRIC 1,200 ELECTRIC MOTOR, USED ON BROOKLYN BRIDGE CAR.

The general character of the motor equipment is similar to that in use on the Chicago Elevated and Nantasket Beach roads. The motors are known as the G. E. 1,200, from the fact that under normal conditions each will exert a horizontal effort of 1,200 pounds when mounted on a 33-inch wheel. Four of these motors are employed, one to each axle or two to each truck. They are completely incased and are water and dust-tight. The armatures are of the well-known iron-clad type, the windings being sunk into slots in the armature core. The Eickemeyer winding is used on the armature. By this method the crossing of two wires of large difference of potential is avoided.

The insulation is substantial and each segment of the commutator is of hard-drawn copper. The armature is mounted on a sleeve keyed to the shaft, which may be withdrawn without interfering with the armature structure. The field frame is of cast steel. The ratio of reduction between the armature shaft pinion and the wheel gear is 3.5 to 1.

Each motor weighs about 3,000 pounds. With this equipment and the regular train a speed of about 15 miles an hour may be obtained. Each motor is suspended on the truck from two trunnions in the upper field set in two bars, the outer ends of the bar resting on elliptical springs. The axle is thus relieved of nearly all the weight of the motor.

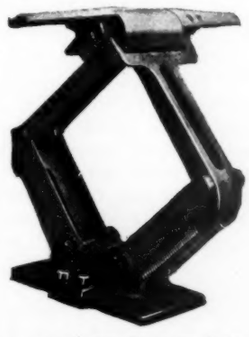


FIG. 3.—COLLECTOR USED ON BROOKLYN BRIDGE CAR.

At the base of each motor, facing the ends of the car, is a small roller, which depresses the cable and allows it to pass the motor without injury, while a long iron bar runs beneath the truck and depresses the tilting sheaves, preventing them from striking the motor.

The operation of the motors is controlled by series parallel controllers of the L 4 type, which have given such general satisfaction on the Chicago roads.

The indicating dial of the controller is placed at the top of the platform rail and is lettered "series," "multiple" and "off," showing exactly the position of the controller itself. The reversing handle is a jointed handle, which can be placed on or taken off the reversing switch spindle only when the controller handle points to the "off" position, showing that there is no current in the motors at that moment. The controller itself has no effect until the long arm of this jointed handle is dropped into the "forward" or "reversing" notches in the reversing handle plate. There are two controllers, each operated from its own platform, and either controller will operate the four motors or any two of them, as may be desired.

The resistances, as well as the magnetic cut-outs, are also placed beneath the car floor. Beneath each hood of the car is an automatic circuit breaker placed within easy reach of the motorman. The operation of this device is instantaneous and is an effectual safeguard against any accident to the motor. These circuit breakers take the place of the main circuit hood switches, but are wired in multiple with each other instead of in series. To guard against any possibility of one being closed while the motorman is at the other end of the car and desires to open his main circuit, only one handle is provided. The handle can not be taken off without opening the circuit breaker and when removed the circuit is locked open. As the motorman must take the controller and circuit breaker handles with him when changing ends, all danger of complication is avoided.

The car is equipped with 12 electric heaters. This system of heating has been extensively adopted on the surface cars in the city of Brooklyn and the consequent abolition of the objectionable stove has caused a general feeling of relief. The heaters consist of a slab of porcelain, in front of which is a cylinder of porcelain wound with galvanized iron wire. These heaters have a maximum capacity of 40 square feet radiating surface at 400 degrees Fahrenheit. Five different temperatures to suit the weather can be obtained by means of a controlling switch.

The collector, which will take the current from the overhead wire, is a diamond-shaped frame of metal set longitudinally upon the roof of the car and carrying at right angles a bar in the center of which is a roller. The arms are wide enough to preclude any possibility of missing contact. The diamond frame is depressable and expansible on the principle of the pantograph, allowing a play up and down to conform to the varying heights of the overhead wire. With this collector the trouble of reversing is entirely done away with.

The power to run the car will be taken from the overhead wire already in position supplying current to the electric lights in the cars. The extra current, however, will be supplied from Fulton street feeder of the Kent avenue station of the Brooklyn City Railway, the return wire being connected to the rails of the surface road. In time a power house will be specially built.

TELEPHONE NEWS AND COMMENT.

The City Council of Houston, Texas, has recently granted to the Southwestern Telegraph and Telephone Company a franchise for underground work.

Cable dispatches received in New York city from Paris last week stated that the French Inspector-General of Telephones has embezzled a large sum of money and has fled to escape arrest.

The Ocala, Fla., telephone system has now reached a total of 85 subscribers, and an all-night service will soon be established. Later a fire-alarm system will be put in for the convenience of the department.

A press dispatch states that the Canton, Ohio, Council claims that the Central Union Telephone Company is operating without a charter, and therefore refused to allow new extensions to the local company in the field.

Since the introduction of another telephone company in Elizabeth, N. J., the rivalry between it and the old company has been bitter and aggressive. It is said that the new company will soon place 60 more telephones in houses not only in the city but in suburban residences.

The Erie Telegraph and Telephone Company's statement of subscribers for the year 1895 is as follows:

	Dec. 31, 1894.	Dec. 31, 1895.
Exchange	14,997	17,404
Agency	1,177	1,187
Total	16,174	18,591
Net Gain		2,417

A hearing on the Senate bill to grant a patent on a microphone transmitter to Daniel Drawbaugh came up before the Senate Committee on Patents on February 4. The hearing was adjourned to permit the Bell company to show cause why a patent should not issue to Drawbaugh.

The Central District and Printing Telegraph Company, the local Bell company operating in Pittsburgh, Pa., has lost $50,000 worth of underground cables in that city from electrolysis, due to the electric railway return current. A year ago the company lost some cables in the east end of Pittsburgh from the same cause.

A bill has been introduced in both houses of the New York State Legislature providing that telephone rates shall not exceed $125 a year in cities of over 1,000,000 inhabitants; in cities of between 1,000,000 and 500,000 not to exceed $85; between 500,000 and 100,000 not to exceed $48; between 100,000 and 20,000 not to exceed $36, and in other places not to exceed $27 per annum. The State Comptroller, Attorney-General and State Engineer are designated as a board to fix telephone rates within the above prescribed limits.

The Nixon Telegraph and Telephone Company is having a hard time obtaining possession of the poles and wires formerly owned by the New England Printing Telegraph Company in Providence, R. I., whose property and franchise it recently purchased. A hearing was held recently in Providence before the City Council Committee on Ordinances, and the Providence Telephone Company appeared to oppose the granting of the franchise. It was alleged that the company had no legal rights in Massachusetts and should have none in Rhode Island.

The Southwestern Telegraph and Telephone Company's Texas subscribers may now talk over 600 miles of copper metallic circuits wholly within the State. In 1881, when this company took control of the telephone business in Texas, there were four inferior exchanges in operation. In 1883 the four exchanges had grown to 24, and the subscribers numbered 2,684. At the close of the year 1895 there were, in round numbers, 6,300 exchange subscribers in Texas, which shows a gain over the previous year of more than 1,200. There are now 36 exchanges in operation within the State, four of which were established during the past year.

The recent death in Washington of John Tyler, a son of President Tyler, brings out the fact that John Tyler was a friend of Samuel F. B. Morse in his youth. According to a newspaper story, Tyler recently told a friend that the first telegraph message was not "What hath God wrought," but was a greeting from the President to Chief Justice Taney, who was at that time in the Baltimore & Ohio depot in Baltimore. The Chief Justice returned the greeting. Much discussion was then excited in regard to the relative speed of electricity and the railroad, and it was decided to put it to the test. The annual message of the President to Congress was given in manuscript to an operator in the depot just a block below the Capitol building, and another copy to the driver of an engine which waited in the depot tracks. The message was to be delivered to Congress and then young Tyler was to go on the outside of the Capitol and wave his handkerchief as a signal for the telegraph and the engine to start to work. At last the watching eyes caught sight of the fluttering linen and, with a leap, the engine was out of the city and speeding toward Baltimore, while the wires began to flash the words by lightning. When the train pulled into the depot at Baltimore, the driver was surprised to find that he had been beaten, and that the message was already set up in type in the newspaper offices in the city.

A motion was made in the Supreme Court of the United States at Washington on February 3 by Attorney-General Harmon, as special counsel for the United States, to advance the Berliner telephone patent case for an early argument in next term of the court. The brief in support of the motion sets out that the suit is brought to obtain the repeal of the patent granted to the American Bell Telephone Company as assignee of Emil Berliner, the alleged inventor, on the ground that the application for it, filed in 1877, was not issued until 1891, it being unnecessarily delayed in the Patent Office, the assignee promoting said delay for his own interest and in fraud of the rights of the public and in violation of his duty to the public; that said Berliner patent practically controls the art of telephony, and having been thus delayed until 1891 (the patent of Alexander Graham Bell for the speaking telephone expiring in 1893), operates to prolong the control of the art of telephony for 15 years beyond the time when, by the expiration of the said Bell patent, such control should rightfully cease; that said patent was granted by the Commissioner of Patents without authority of law, being for the same invention for which patent had been granted to the same applicant in November, 1880. If the United States are right in their contention that the Berliner patent, for the reasons stated, ought to be repealed, it is of great importance to the public that the repeal should not be unnecessarily delayed. It is understood that the counsel for the American Bell Telephone Company will not oppose the motion.

Enclosed Flywheels.

A friend of one of our correspondents has been boxing in his large flywheel, says *Power*, and claims that he saves considerable power by doing so. The correspondent is inclined to deride the claim and considers the boxing a needless expense.

An unboxed flywheel acts as a centrifugal air pump or fan. Air flows into the wheel at the center and is thrown off at the rim. Power is consumed in imparting motion to this air just as it would be in pumping it by any other means. When the valve is closed on a centrifugal pump the consumption of power ceases, beyond that necessary to revolve the shaft in its bearings, and overcome the friction of the fluid which has been shut in. A close casing about the wheel might be expected to reduce this fan action, and thus reduce the work of turning the wheel. On the other hand, the fan action may be usefully applied. We know of a case where the air is taken from the outer edge of a flywheel casing and conducted through a coil heater into the mill, the excess of pressure at the rim casing being sufficient for the purpose. Of course, in this case, a central opening is necessary, whereas, if the casing is to save power, it should be made as tight as possible about the center.

The Bridgeport, Ct., Electric Light Company has now reduced the price of city lights from $102 a year to $95.

ELECTRIC RAILWAY NOTES.

The Toledo, Ohio, Traction Company has raised the wages of its employés voluntarily.

The Brooklyn Heights Railroad Company, of Brooklyn, N. Y., has been given permission to occupy the bridge plaza with its tracks.

The Springfield Street Railway Company has asked the Massachusetts Railroad Commissioners for approval of an issue of $100,000 bonds to take up short-time notes.

Forced by trolley competition, the Michigan Central Railroad has cut rates in two from Bay City to Saginaw, Mich. It is reported that the Flint & Pere Marquette and Grand Trunk roads will follow suit.

The Elm street system of street railways at Dallas, Tex., has been sold at receiver's sale to George W. Davenport, who bid the property in at $100,000. Mr. Davenport, it is said, represents eastern bondholders.

The board of directors of the Milwaukee, Wis., Electric Railway and Light Company has been organized, and the following officers elected: President, Wm. Nelson Cromwell; vice-president, Henry C. Payne; secretary, C. A. Spoffard; treasurer, Edward Edes. Executive Committee, Messrs. C. W. Wetmore, George R. Sheldon, C. A. Spoffard and Wm. Nelson Cromwell.

The West End Street Railway Company, of Boston, has equipped its central power station with three large dynamos, built by the General Electric Company, one having 3,000 horse-power, the others 2,000 capacity each. When all is completed it is calculated that 20,000 horse-power will be generated at the Albany street station. Two more of these dynamos are being put into the Charlestown station.

Judge Bunn, of the United States Court, has issued an order at the request of the Central Trust Company, of New York, placing the Superior, Wis., Rapid Transit Company in the hands of a receiver. S. T. Norvel, of Superior, and F. W. Oakley, of Madison, were appointed by the court as receivers. The Rapid Transit line connects the cities of Superior and Duluth, and is owned principally by eastern capitalists.

The project for a trolley line from Camden to Atlantic City, N. J., which has been discussed for several years, has again been revived, and capitalists of Philadelphia, New York and Camden are said to be interested in the plan. A conference was held recently, and a number of reports submitted by experts were discussed. It is proposed to organize a company with a capital of $2,000,000. Agents, it is said, have obtained options on old rights of way across New Jersey. It is intended to furnish express and freight accommodations. An entrance to Camden will be secured over the tracks of the Camden, Gloucester & Woodbury trolley road.

ROENTGEN'S SHADOWGRAPHS.

BY R. H. READ.

A great deal has been said in the daily and technical papers lately about the shadow pictures made by the radiant non-luminous emanations of a Crooke's tube, discovered accidentally a few weeks ago by Professor Roentgen, of Wurzburg, Germany. The usual amount of speculative gush and guesswork has been indulged in, but very little has been done or said to show the true character of the waves which produce the remarkable results noticed by the German experimenter. It has generally been taken for granted that the waves are long and not short ones, and numerous scribes have jumped to the conclusion that they are the same in character as the electrical vibrations investigated by Heinrich Hertz. A very simple test made by an English experimenter is more to the point than reams of such guesswork; he interposed trays of alum and iodine solutions respectively in the path of the rays and found that a sensitized silver surface beneath them showed on development that the alum transmitted and the iodine absorbed the rays. This seems to be a fairly conclusive indication that the rays lie in the violet or ultra violet region of the spectrum; that is to say, their wave length is very short, a fact which coincides with their actinic power on the haloid salts of silver. The long ether waves do not materially affect silver salts, a fact which every kodak fiend emphasizes when he develops a negative under a ruby light. Another point worthy of remark is that the whole world is talking about the "new light," whereas it is not a light at all, since the waves lie in a non-luminous part of the spectrum and produce no apparent effect on the optic nerve. That they find substances opaque to luminous waves perfectly transparent is a fact which will no doubt be turned to good practical uses; but there is indeed nothing scientifically remarkable in this, since it is well known some opaque substances, such as sulphur and iodine, will freely transmit heat waves, although opaque to light; and others, such as alum solution, are transparent to light and opaque to heat; but the fact of importance is an industrial one, namely, that Roentgen's rays penetrate the ordinary fluids and solids of every-day experience, even metals. A fact worth dwelling on is that the rays are artificially made by electrical excitation; it is scarcely possible they can exist in sunlight, since it would otherwise be impossible to protect photographic plates for shipment, storage and manipulation in pasteboard and wooden boxes, paper and wood being very transparent to the new rays; it is quite possible that they may be absorbed by our atmosphere and may really be present in incandescent metals and gases. The opportunities opened to scientific work by this discovery are vast; it points to new methods of exploring spectra and differentiating wave lengths about which we now know nothing except by conjecture. The industrial possibilities will be great if some means of forming an image or of focussing the rays are found; there is scarcely a doubt that this will come, whether the waves are longitudinal, as Professor Roentgen supposes, or transverse light waves. Sound waves are longitudinal, yet they may be reflected and refracted and focussed. With this additional step taken the results will be as far superior to those as yet attained as a photograph is to a silhouette. When a true image can be made by means of the new rays, the results in surgery, metallurgy and all industrial arts and sciences, in which it is important to see the inner structure of opaque bodies, will be magnificent.

FIG. 1.—RUSHMORE PROJECTOR.

FIG. 2.—PILOTHOUSE LIGHT WITH NEW CONTROLLING ATTACHMENT.

FIG. 3.—SMALL PILOTHOUSE LIGHT.

The Ball & Wood Company.

Among the New Year changes in business, which will interest engine men, it is learned that Mr. F. H. Ball has sold his interest and retired from active participation in the management of the Ball & Wood company, of Elizabeth, N. J. Mr. Ball has been one of the officers of this company for a number of years and retires to take up actively the profession of consulting engineer and mechanical expert, in which capacity he will still be connected with the company. His son, Mr. Bert C. Ball, also remains at the head of its draughting department. The business of the Ball & Wood Company has been excellent during the past year and has extended largely through the West since its Chicago office was opened a year ago. At present its shops are very busy executing the contract for a number of large engines for the Edison Electric Illuminating Company of Paterson, and also orders for the New York and Brooklyn Bridge; Johnston Building, New York; Ellicott Square Building, Buffalo; St. Charles Hotel, New Orleans, and others.

FIG. 4.—RUSHMORE APLANATIC LENS.

New Search-Light Apparatus.

The Rushmore Dynamo Works, Jersey City, N. J., who have for years engaged in the manufacture of search-lights and electrical apparatus for marine use, have in the last year brought out a complete line of high-power lens mirror projectors or search-lights for commercial and naval use.

In the common, so-called "search-light" there is an ordinary locomotive headlight reflector fitted with an arc lamp in place of the oil wick, and while this reflector absorbs nearly all of the light, it can not be built for high power, as it soon rusts away.

In the new Rushmore projector there is mounted in the rear of the cylinder, as shown in Fig. 3, a large silvered lens, and a special focusing lamp lies in a case in the bottom of the cylinder, which is entirely empty except for the slender carbon holders which cast no shadow, and the carbons are so placed that all the light generated is thrown directly upon the mirror and is projected forward in a perfectly straight beam. This arrangement, which avoids all risk of heating, permits the use of a most powerful current in the arc, and by recent tests it has been shown that the projected beam has a power of over 1,000,000 candles per ampere in the arc.

Fig. 1 shows the plain projector as used in the navy and on large lake and ocean steamers. Fig. 2 shows the pilothouse light fitted with new controlling attachment for operating from within the pilothouse. Fig. 3 shows the small pilothouse light with front and back door open, showing the lens and lamp, from which it will be seen that it is easily cleaned and supplied with new carbons. Fig. 4 shows the new Rushmore aplanatic lens with reversed image. This new lens has the remarkable property that by a slight movement it causes the narrow beam to be spread over a wide area, thus dispensing with the heavy and costly diverging lenses used in the navy. Fig. 5 shows the new concentric lamp used in the projectors. Another type of this projector is fitted with a small motor in the base so that the light may be placed at any point on the ship and the beam thrown in any direction by means of a small electric controller in the pilot house, thus doing away with all mechanical connections.

This apparatus is designed for the roughest commercial use, and is free from all complications. The power of these new lights is said to be something wonderful. Quite a number are already in use and are giving entire satisfaction. The Rushmore works have a complete lens-making plant, with which they have reduced cost of lenses, bringing the cost of the best projectors to but little more than the old-style headlights.

FIG. 5.—CONCENTRIC LAMP USED ON PROJECTORS.

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SPECIAL NOTICE TO ADVERTISERS.

***CHANGES** for advertisements must be in this office by Friday noon for the following week's issue.*

***NEW ADVERTISEMENTS** should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, FEB. 12, 1896.

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From the way the new government bonds were snapped up there seems to be an abundance of gold in this country. The wise business man will now strive with renewed energy to attract it in his direction. There are several ways to do this, and, if you have something to sell, no better one exists than publicity, publicity, publicity.

THE BUSINESS SITUATION.

Now that the finances of the government are at least temporarily adjusted, the manufacturing industries of the country should speedily revive and the tone of general business assume a brighter hue. It is certainly a remarkable evidence of the resources of the people of the United States when six dollars in gold was offered for every bond dollar to be issued by the government.

The highly successful placing of this latest bond issue will undoubtedly restore confidence to a large degree, and should also tend to ease the money market. Inability to make ready collections is one of the chief causes of the recent depression in the electrical trade. There is now every indication of more prosperous times. Electrical manufacturers and supply men should endeavor to gradually increase the selling prices of their product and lower their manufacturing cost. Only time and a steady purpose can restore the prices at which a good profit can be made on electrical goods. There has been entirely too much cutting of prices in order to secure trade—an evil which a return of prosperous times will go far toward curing.

DR. BANTI RECEIVES AN ELECTRIC SHOCK.

Dr. A. Banti, of Rome, Italy, editor of our esteemed contemporary, *L'Elettricista*, recently received by accident an electric shock from a 600-volt current which had the peculiar effect of depriving him of his eyesight for several days. He has now recovered and thinks he will experience no further evil consequences from the accident. Dr. Banti is a prominent Italian electrical engineer, who lately installed the Thomson-Houston electric railway system in Rome. It will be remembered that current for this system is supplied by the Tivoli installation. This current, by means of transformers, is reduced to the required voltage.

The Cuban insurgents recently captured a small town and the commander telephoned to the head officer of the Spanish fort in the suburbs that if he would surrender by telephone the insurgents would be saved the little bother of marching out to the fort and capturing that also. After discussing the matter pro and con over the telephone, the two opposing commanders reached an amicable conclusion and the fort surrendered. At least, this is the report sent out. Great is the telephone in war or peace!

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The phenomenal success of the government bond issue, which resulted in a six-times-over subscription of the $100,000,000 bonds offered, completely revolutionized sentiment in financial and business circles during the latter half of the week. It was a notice to the world at large that Americans have faith in their institutions. Moreover, it was the most scathing kind of a rebuke to a clique of Senators holding the balance of power, who are trying to debase our currency by placing it upon a free silver basis. It has often been said that confidence is three-quarters of the circulating medium of this country. It has been sadly shaken of late and will naturally require time in which to recover. That there are tendencies in this direction, there is no doubt. Just now the business world is suffering through numerous commercial failures that were largely the result of over-speculation in staples during the late Summer of 1895. It is believed that the bond sale will silence fears concerning the gold reserve for a year to come and that values of all securities and commodities, which are now on a basis that discounted everything in the situation or outlook that was unfavorable, will have a sharp recovery. This ought to stimulate trading in all lines and give the Nation an era of prosperity. Most stocks advanced in the week and closed at about top prices. The market expanded, drawing in considerable capital that had been held back for bond subscription, and which was not successful in receiving allotments.

Electrical securities this week reflected the general improvement. The advance in Western Union was over a point. American Telegraph and Cable was steady and unchanged, from 92 to 92¼, and the Edison Electric Illuminating of New York 5 per cent bonds, old issue, sold at 107½.

In Boston, Bell Telephone gained two points to 202. Erie Telephone was firm at 62, up to the last of the week, when it dropped a point. New England Telephone gained one point to 89. Westinghouse common weakened somewhat, going to 29¾ @ 30. The preferred was unchanged at 53 @ 53½. In Philadelphia, Electrical Storage stocks were practically featureless. The demand was limited and quotations ended the week without material net change.

General Electric was the center of activity and interest in the electrical group. The high quotation on Monday was 30⅛; the low was 27½ on Wednesday. On Saturday the price touched 30 and closed a fraction thereunder. The midweek decline was due to a knowledge by market interests of the significance of the Manhattan equipment contract involving the Thirty-fourth street branch and not the entire system. The recovery is largely based upon manipulation. The bonds sold at 90 on Monday and later in the week at 88 and 89. I can state upon author-

ity that the company has canceled the 1¼ million bonds bought in some time ago with its surplus earnings.

I am also told that the long looked for correction of the impairment in the General Electric capital is now receiving attention of the directors and that a proposition will be subjected to the stockholders at the annual meeting in May with this end in view. The plan has not been determined, but will probably involve a scaling of both classes of stock. The movement of Administrator Carr, of the Ames estate, to unite the preferred shareholders for the purpose of bringing about a settlement of the 17½ per cent back interest, I understand, is entirely friendly, and is a move necessary to a completion of the financial plans under consideration by the directors.

The statement that the company will have $800,000 cash on hand at the end of the year, emanating from Boston, I am told, is correct. It is probable that it will earn 2 per cent or more on the common stock. It is understood that no important amounts will be charged off this year as against heavy sums during the two previous years.

The company has made some big contracts lately, among them the West End contract, of Boston, for additional equipment. It also has in prospect the placing of apparatus for the underground operation of those lines of the Metropolitan Traction Company now operated by horses. It recently completed a successful test on the Brooklyn Bridge. It does not regard the Manhattan contract, so called, as anything likely to eventuate for some time, and believe that it will come, if at all, piecemeal, as was stated in this column some months ago.

During the week, events in the New York traction field took on a new phase. Negotiations between Brooklyn Elevated and Manhattan for a close traffic arrangement, involving the use of the Brooklyn Bridge, stirred up the Metropolitan Traction Company. This resulted in a proposition from its capitalists of $140 per share for control of Manhattan or at least on an 8 per cent basis.

The matter is in the hands of President Geo. J. Gould and stands some chance of consummation.

BAIN.

New York, February 8, 1896.

A Particularly Attractive Catalogue.

The Adams-Bagnall Electric Company, of Cleveland, Ohio, has issued a fine catalogue of the "A-B" arc lamp which should prove to be an order winner. The excellent illustrations and clear descriptions of the company's many types and styles of arc lamps show that an experienced man has prepared the tome. This, together with certain "cute" and curious "catch" cuts and arrangements, betrays the fine Italian hand of General Manager Rogers. No one can have the ELECTRICAL REVIEW's copy of this catalogue; if you want one you'll have to see Colonel Rogers about it.

Gates Electric Manufacturing Company Assigns.

The Gates Electric Manufaturing Company, the offices of which are in the Monadnock Building, Chicago, failed on January 31. The company made an assignment to the Chicago Title and Trust Company for the benefit of its creditors. The assets are said to be about $17,000, and the liabilities about $8,500. The company was formed to manufacture electric machinery, and its plant is at Clinton and Harrison streets on the fourth floor. The president of the company is J. Holt Gates. The attorney for the assignee states that the company had a valuable plant and a number of contracts on hand, but it was unable to make collections and procure ready cash to carry on its business. It is expected that the creditors will be paid in full.

The assignee of the Standard Electric Company, of Chicago, has just completed and filed an inventory which shows as follows:

Machinery and tools	$32,684 64
Merchandise and manufactured machinery	94,490 27
Bills receivable	5,449 21
Accounts receivable	73,393 45
Office furniture	75 00
Real estate	60,400 00
Stocks and bonds	5,750 00
Total	$272,242 57
The liabilities are	100,142 97
Total of assets over liabilities	$172,099 60

Mr. E. E. Crepin, treasurer of the company, writes to the ELECTRICAL REVIEW as follows:

We are satisfied that the estimate of the assets as above stated is a fair one, and that all creditors can be paid therefrom in full, without expense of any kind on their part.

An impression has arisen that there is or was some especial reason for our making an assignment other than that which appears, and that with the assets as stated we should have continued in business. Our answer to this is that, owing to the stringency of the times, difficulty of making collections and inability to meet our obligations as they became due, it was thought best to make the assignment as stated.

The schedules in the assignment of the George F. Colgate Company, dealers in electrical supplies, 136 Liberty street, New York, were filed last week and show the following: Liabilities, $8,763; nominal assets, $18,548; actual assets, $14,003.

The W. A. Harris Steam Engine Company, of Providence, R. I., has assigned. Liabilities, $64,000. The assets consist of plant, buildings and machinery, which are insured for $175,000.

It is reported that Columbus, Ohio, street railway stock dropped about five points recently on the application of the Columbus Central Railway Company for use of the former's tracks for one mile under laws of the State of Ohio by which any street car line operating eight miles of road may run its cars over one mile of track of any other established road.

EDISON EXPERIMENTING WITH X RAYS.

THE "ELECTRICAL REVIEW" INTERVIEWS HIM AT WORK—HAD "THE BOYS" UP MOST OF LAST WEEK—HE HASN'T FOUND OUT YET WHAT X RAYS ARE.

By appointment a representative of the ELECTRICAL REVIEW met Thomas A. Edison at his laboratory in Orange, N. J., early—very early—on Monday morning of this week. Edison is a man who knows nothing of the passing of day and night. All he wants is time, and whether it's daylight or dark makes no difference to him or his assistants.

Last week he devoted to experiments in the new X ray photography with Crooke's or Geissler tubes of his own manufacture. He had "the boys," as he calls his assistants, working most of the time. When Saturday night came Edison had been working steadily the better part of 70 hours; so he went home to rest on Sunday. Bright and early Monday morning he appeared at the laboratory as chipper as a lark, but a little grayer after his three years' hard work on his magnetic ore separator at the Ogden iron mines, Edison, N. J.

When the REVIEW man stated that he had come to learn if Edison had achieved any new results on the lines laid out by Roentgen, the inventor laughed and said:

"Oh, no. The boys and I are just having a little fun. I'm simply trying to verify Roentgen's work and may be I'll strike something new while I'm at it. Come in and I'll show you what we've done and are doing."

As he led the way up-stairs to his workshop, the REVIEW man asked Edison if he had formulated any theory of his own as to what the X rays were.

"No," he said, "we don't know where we're at. The rays may be heat waves and they may be sound waves. I think they are caused by some movement of the ether. I hope they are, any way. I'm trying to find out in what direction they move. If they take a curved path, like magnetic waves, I'll have a little trouble to trace them. If they move in lines like the light from an incandescent lamp, I'll get them."

On arriving in the workroom where the experiments are being carried on, Edison continued:

"I'm making my own Geissler tubes for this work. I simply use an incandescent lamp in which is inserted a cathode. I am trying tubes of different degrees of exhaustion, and later I'll try tubes filled with various rarefied gases. I'm also going to try different substances for cathodes.

"Now, you see this bit of cardboard. On it I have fastened strips of equal size of hard rubber, celluloid, steel, white glass, zinc, aluminum and lead. I'm working only with these substances—not trying to make pictures of legs and arms and things. The X rays go through the celluloid better than any of the other substances and seem to penetrate steel the least. I find that I get sharper pictures and better results if I use the tube while it is being exhausted. There is some point between minimum and maximum exhaustion at which the best results are obtained. I'm trying to find that point

"Whether there is anything commercial in this X ray business or not I don't know. We're all at sea on it. I've got a note book full of data which may work out to something good and practical. I'm working on another line of experiments on which the results I get with X rays have some bearing. It's only fun, anyway, but I'm liable to keep the boys up every night this week, too. I'll tell you one thing. The ELECTRICAL REVIEW has been dead right in calling Roentgen's rays 'X' rays. That's what they are—unknown."

The ELECTRICAL REVIEW man suggested that Tuesday, February 11, would be a good day for Edison to make a great discovery. "Why?" he asked.

"Because that is your 49th birthday."

"Is that so? I'd forgotten about it. When you're working, all days and nights are alike."

PERSONAL.

Mr. Myron Knapp, of Chicago, recently paid a brief visit to the metropolis.

Mr. J. J. Gates, of Hartford, Ct., was among last week's visitors to New York city.

Mr. S. Dana Greene, of the General Electric Company, expects to sail this week for Caracas, Venezuela, where he will spend a month's vacation.

At the recent annual meeting of the Electricity Newspaper Company, of New York city, the following officers were elected: Edward Weston, president; A. M. Aich, treasurer, and L. J. Montgomery, secretary.

Mr. F. E. Drake, until recently general agent of the Standard Electric Company, of Chicago, has severed his connection with the assignee of that company and is making arrangements to again enter the electrical field.

Major A. G. Postlethwaite, former controller of the St. Paul and Northern Pacific Railroad Company, and general land agent of the Northern Pacific Railroad, has been elected vice-president and a director of the J. C. McNaughton company, wholesale dealers in lumber and railroad ties, of Philadelphia, to succeed Mr. Louis C. Maus, recently deceased. Major Postlethwaite, in connection with Mr. J. C. McNaughton, established the business of the J. C. McNaughton company in 186-, and then returned to his original business, after nearly 30 years spent in railroad service with the Pennsylvania, the Erie and in the West.

ELECTRIC ELEVATORS, WITH DETAILED DESCRIPTION OF SPECIAL TYPES.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK AND CHICAGO, JANUARY 22 AND 29, 1896, BY FRANK J. SPRAGUE.

(*Continued from page 73.*)

There are exceptional conditions in which a higher economy can be gotten in a hydraulic system, but they are few and are not typical, and, under equal conditions, the steam consumption in an electric system can be cut in two.

But this is not all. The fact is persistently ignored, although the attempt is made to offset it by recent experiments with a differential piston, that a standard hydraulic elevator uses the same amount of water under the same pressure for every foot of travel of a car, which volume of water and pressure are determined by the maximum load which has to be carried, although the average load on the ropes, including the excess of car over counter-weight, is not over one-third of the maximum. On the other hand, the electric elevator uses, and must use, under normal conditions, current directly proportional to the work, modified in a small degree by starting and slow running.

In short, over and above the friction load of the generating system, the steam consumption in the engines and the generation of electricity in the dynamo vary with the demand of the elevator machines. It is a system which is of necessity automatic.

On the other hand, the hydraulic system is one of the most flagrant violators of the relation which should exist between demand and supply. It is a system of transmission by water, having at one end a generating plant doing full duty for every foot of travel of its piston with a variable duty on an elevator car at the other end, and an intermediate straight-line water engine with its pipes and tanks taking care of that variable duty and using the balance of its energy in heating the water which passes through its valves.

Lack of economy, however, is not the only objection to the hydraulic system when looked at from the architect or builder's standpoint. Until recent developments, these have always been strictly handicapped, not so much, perhaps, in the matter of cost, but in the internal arrangements of the building as well as in the lay-out of the basement, neither of which could be finally and satisfactorily, if even then, determined, until the particular type of machine had been accepted by the owner and the contract finally made for it.

Nor has there been either singleness of design or unity of plan of operation. Each maker has had his own form of construction, his special method of control. Every building has brought up a problem more or less new, or at least conditions which had to be seriously considered in determining the elevator service. Horizontal and vertical machines, in basement of shaft; high or low multiplications; long and short, single and jointed, cylinders; big and little diameters; large and small sheaves; free and suspended counterweights; pulling and pushing machines; direct and differential pistons; roof tanks, stand-pipes, accumulators and compression tanks; high and low pressures; hand rope, wheel or pivot-valve control; simple or compound pumps—all have made a nightmare of complications, giving more initial and continuing source of complaint and dispute than all the other engineering problems in a building.

So what is more natural than that they should turn to electricity for emancipation? And this tendency is augmented by other reasons.

Leaving out central station supply, always, when properly equipped, to be preferred when the electric service is of a spasmodic or limited character, and considering for the present those large plants which characterize the modern office or hotel building and in a way rival central stations, every engineer knows that the fewer the number of well proportioned units, the more alike they are, the freer the interchangeability between themselves and the greater the extent to which any one unit can be utilized, the better the system for power generation and conversion, no matter what its character.

The best modern practice makes a three-unit direct-connected engine and dynamo plant the best for lighting a building. There is an empirical relation existing between the number of lights required in a building as ordinarily designed and the elevator service. When, in addition to the lighting service, such a building adopts electric elevators, it is not now necessary that it shall add an independent generating plant.

All that is required is that the three units should be somewhat increased in size and, perhaps, one of them preferably divided, the mains all taken to a common switchboard with two-way switches, and every engine and dynamo thus made interchangeable on either the lighting or elevator circuits, and at times both; especially if using a slow-acting corrective converter, some of each can be run from the same engine and dynamo. So, instead of five or six units, some water and some electric, the entire generating plant is reduced to a single system consisting of three units of one size, or two of that size and two of a half size, which can be run interchangeably, and one of which is almost always in reserve.

Just here it is well to consider the probable application of the storage battery, which, if built with plenty of lead, with large surfaces and for heavy momentary discharges rather than for long-time steady discharges, will prove a most important adjunct to elevator service, which, like railway work, is spasmodic in character.

A modern office electric elevator on actual average service requires an expenditure of about one kilowatt hour per car mile of travel for every 8 or 10 feet of platform area. A car will make from one and one-half to two and one-half miles per hour, so that a battery of six elevators will run from nine to 15 miles, although very rarely making over 12 miles per hour. With an ordinary car, say from 30 to 35 feet area, this would mean from three to three and one-half kilowatt hours per car mile of travel, or say 35 to 40 kilowatt hours for a battery of six machines. Without a battery this would require a 120-kilowatt machine as ordinarily rated, worked at an average of 35 to 40 per cent load. With a properly constructed battery a 60 or even a 50-kilowatt machine will handle the elevators.

Roughly speaking, a storage battery should be able to stand twice the dynamo rate for from three to seven or eight seconds, and the dynamo rate for one-half a minute. If it has an hour-discharge capacity equal to the dynamo capacity in kilowatt hours, it should be perfectly capable to run the Saturday, Sunday and night service required in an elevator plant without losing more than one-half its charge.

So much for the general conclusions on electric elevators, which are necessarily more or less brief.

To meet the hydraulic machine there was designed and developed what is now known as the Sprague-Pratt multiple sheave electric screw elevator, following the general lines of a tension hydraulic machine in the matter of rope movement, limit safeties and method of control.

The net result has been that this machine now stands the superior to the hydraulic elevator in that it has its speed and capacity with, if anything, greater safety and certain advantages in its automatics.

On high lifts it occupies less space; it is more flexible in its application, is more economical to operate and it is more easily cared for.

GENERAL DESCRIPTION.

The machine may be described as the combination of two old elements with one new one, with specific safeties and methods of control.

Briefly, it is of the horizontal multiple sheave type, with a traveling crosshead and frictionless nut driven by a screw revolved by a motor directly connected and governed by a pilot motor and rheostat.

The general construction consists of a heavy main beam carrying the traveling crosshead and the lower screw bearing, with special castings bolted at each end, one carrying the fixed set of sheaves and the other the thrust bearing, brake and motor. The regulating apparatus is independent and self-contained, and is placed on the wall. From the car to the system of multiplying sheaves the direct multiplying machine and the horizontal hydraulic elevator are practically the same. The crosshead, however, marks the point of departure in the two types.

In the hydraulic machine, this crosshead is rigidly attached to the end of a rod which terminates in a piston moving in a cylinder having an inside length equal to the lineal movement of the crosshead. This cylinder in the vertical type of hydraulics varies from 30 to 50 feet in length, with from two to 12-sheave multiplications, and in the horizontal types the multiplication runs as high as 14, with corresponding diminution of length of cylinder and increase in cross section. Whatever the gearing, however, the length of cylinder is a function of the car travel. In this electric elevator, the crosshead being moved along a screw, stationary so far as the lineal movement is concerned, there is, with any given number of sheaves—only one variable—the length of screw; and, for all heights above about 100 feet, the electric machine has an advantage in matter of length, which, with increased rises, becomes of great importance.

Looking to the needs of office buildings, there has been adopted two methods of rope multiplication, determined by the height of building, and so selected that the length of machine over all shall not exceed about 30 feet for rises approaching 300 feet actual car travel. From this the length grades down to about 21 feet, so that all rises between 60 and 300 feet can be taken care of with an extreme variation of 9 or 10 feet in the length of machine, and there is thus provided limiting dimension data of great convenience and utility.

These systems of multiplication I may term direct and indirect. In the former, the entire multiplication, varying from 6 to 10, is done at the machine, and the ropes lead from the end sheaves over the shaft sheaves direct to the car. A free counter-weight is used, the ropes being fastened to the car frame. In this method, which is that common to all horizontal and to many vertical hydraulic machines, the hoisting and counter-weight ropes have unequal duty; furthermore, the ropes having the maximum bending, travel on the outboard sheaves at the same speed as the car. This last is the case also with all vertical hydraulics. In some of the latter the counter-weight is carried in the cylinder on the piston, or in the strap, or both, its weight being as many times that of a free counter-weight as there are multiplications. Sometimes both methods are used.

Economy of operation and smoothness of movement, however, are antagonistic in their relations to the amount of counter-weight carried. The best method is probably that used when there is a single multiplication in the shaft, giving a two to one counter-weight traveling at half speed, and carried by all the car-hoisting ropes, as is done for short-rise vertical hydraulic elevators.

For long rises I have adopted a combination vertical and horizontal machine-rope practice, giving even a more compact machine, a longer life of ropes and better counter-weight results.

In this indirect system there is a division of multiplication, which, while having the same effect so far as speed of car and length of machine are concerned as a high direct multiplication, has an entirely different result in the wear on the ropes and the amount of counter-weight which can be carried without jumping.

This is accomplished by making one-half the multiplication (six or eight) on the machine, the ropes, properly proportioned, going thence to the bottom of the counter-weight frame, which has a single multiplying sheave on top. The car ropes go over the shaft sheaves, under the counter-weight multiplier, and back up the hoistway, where they are anchored, giving a car speed twice that of the counter-weight. The equalizing chains, used to make the pull of the car with any given load constant at all points of the hoistway, are fastened to the bottom of the counter-weight frame and anchored in the hoistway.

The space occupied by this multiplier is only two or three inches more than by ordinary form of counter-weight. A proportionally shorter screw, fewer revolutions and sheaves of greater diameter characterize this type of multiplying machine.

This system seems to be the best yet devised for long rises, for not only do all the car ropes do equal duty, both with relation to the hoisting strain and the counter-weight, but the rope wear must be less because of the division of speed and multiplication, the necessity of changing only one-half of the ropes at a time and the possibility or reversal of the ropes on the multiplying machine to get a new wear.

Where space is limited, I use a double-decked machine, and in the new Commercial Cable Building, which is to be 21 stories high, the machines will be treble decked and about 10½ feet in height.

DETAILS.

Turning now to the detail construction and operation of this machine, there are a number of features claiming special attention, each unique in character and marking a radical departure from all other ele-

vator practice. These are the nut, screw and thrust bearing, the brake, the motor and the regulator apparatus.

One of the most interesting as well as important features, and, perhaps, the one which has been most frequently attacked, is the nut system. It joins the crosshead of the traveling sheaves by a conical seat. There is no fastening between the nut and the crosshead, the continual weight of the car always keeping them in contact; and the friction at this point, being greater than between the nut and the screw, enables the latter to transmit a straight-line movement to the crosshead when the screw is revolved by the motor, and also to revolve the screw and drive the motor as a dynamo when the mechanical brake releases the screw to allow the car to descend. These are the normal functions of hoisting and lowering. There are several other distinct functions of this nut which will be described in considering the "safeties."

Continuing the line of transmission of power, the only points of contact between the interlocking nut and screw are by a chain of balls which occupy a number of threads, and enter and leave the ends of the nut through tubes which are connected together so as to make a continuous conduit. This is one of the most vital points of the elevator apparatus, and herein lies one of the most potent reasons of its success—the reduction of friction by rolling instead of sliding surfaces on almost all parts under pressure; for not only is the nut so constituted, being in fact a developed spiral thrust-bearing, but the thrust-bearing at the motor end of the screw is taken on balls and the sheaves are carried on ball or roller bearings.

This nut being a vital part, its development has been most thorough, and a peculiar treatment of steel which has been adopted renders its surface so hard that the wear is very small, and it is well within commercial limits.

So free is the machine from static friction that it is possible to start the car with a very slight increase of current over the normal hoisting current, providing time be taken so that the work done in acceleration is small to the work of lifting, although that is not the usual practice.

The balls have an average crushing strain of 25,000 pounds each, but the working pressure varies from only 50 to 125 pounds per ball.

The nut system is a compound one, for, besides the working-ball nut there is another, called the "safety-nut," to which I will make reference later, keyed to it, and between the two is a powerful spring under compression.

The screw is a forged bar of high carbon steel with a peculiarly shaped thread, the finished screw having a tensile strength of 700,000 pounds. It passes through the clearance hole in the steel trunnion crosshead, which carries the traveling sheaves then through the nut, and is carried at the outer end by a fixed bearing.

This screw is sectioned, being joined to the armature shaft by a cone-seated coupling, secured by a taper gib.

The in-board end of the armature shaft, which is in effect the extension of the screw, terminates in the thrust-bearing, where the pressure is taken by about 200 steel balls carried in a bronze guide plate and bearing, by specially hardened steel disks. The thrust of the screw being thus taken up on the in-board end, the strain on the screw is invariably between that end and the traveling crosshead—never beyond this; hence, it is always under extension strain—never under compression, and can not buckle.

The action of the balls on the screw, which is untreated, is peculiar. They form a path for themselves, partly by wear, but principally by rolling compression of the steel, which finally becomes exceedingly hard, such that the edge of any ordinary machine tool would be turned.

The balls themselves wear very evenly. Oblique forms in normal practice can not exist.

Beyond the thrust-plates is keyed an iron pulley, connected by a flexible coupling with the motor shaft. The function of the brake is that of locking the screw when at rest; it is not a means of varying the speed. In case of accident, it has the additional function of helping to stop the screw. It may be described as a compound electro-mechanical brake. A steel brake band, wood-lined, is anchored at one end, the hoisting side on the motor-bed frame, and the other end is continually pulled down by a powerful spring under compression. The mechanical movement in opposition is through the medium of a peculiar magnet. It is operated by a dual circuit, one in hoisting, another in lowering. In the event of failure of current for any reason, or too high a speed on the down run, this magnet releases the brake in the latter case by a snap switch operated by an adjustable Pickering centrifugal governor driven by the main screw—and the brake band promptly grips the brake wheel softly yet powerfully.

(To be concluded.)

Edison Electric Illuminating Company of Brooklyn, N. Y.

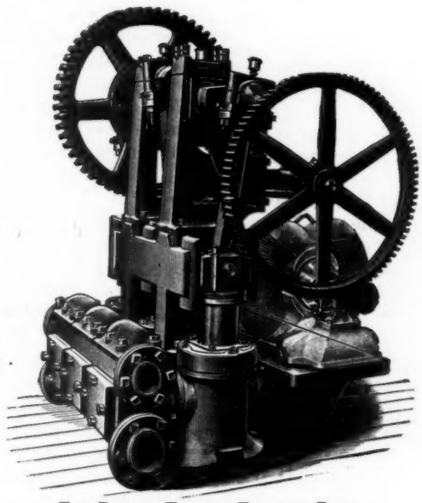
The Edison Electric Illuminating Company of Brooklyn, N. Y., held its annual meeting of stockholders recently and re-elected the following board of directors: Frank L. Abbott, E. LeGrand Beers, Charles E. Crowell, Ethan Allen Doty, Julian D. Fairchild, C. N. Hoagland, Darwin R. James, J. G. Jenkins, Martin Joost, Edwin Packard, Lowell M. Palmer, George Foster Peabody, George H. Southard.

American Institute of Electrical Engineers.

At a regular meeting of the American Institute of Electrical Engineers, to be held on the 26th day of February, 1896, at 8 o'clock in the evening, at No. 12 West 31st street, New York city, a proposition of incorporating said association, in pursuance of section 5 of the membership corporations law, will be acted upon by the members.

The Deming Triplex Electric Pump.

The accompanying illustration shows the Deming triplex electric pump, manufactured by the Deming company, of Salem, Ohio. In the design of the triplex pump the principle of uniform discharge is considered. The manufacturers illustrate this as follows: A double plunger or a double-acting pump has two points in each revolution at which no water is discharged; consequently the variation from the maximum flow to no flow of water is 100 per cent of the discharge. This variation is counteracted in part by air chambers, but the shock or hammer of the moving water injures the pump and absorbs, without doing useful work, a large percentage of the power applied. In the Deming triplex pump, however, the variation from uniform discharge is but 15 per cent from the maximum to minimum in one revolution of the pump shaft, and almost the entire power applied does useful work in pumping. The design of the Deming triplex pumps embodies the best practice, prominent in which the following points are claimed: 1. The strains in the crank shaft are borne between the plunger bearings (not outside of them), the value of which is obvious. 2. All crank-shaft bearings are bronze. 3. Most important to the speed, capacity and lift of the pump is the system of guiding the plungers above and outside the water chamber. Arranged thus the guides can be easily lubricated and maintained in repair and the plungers kept in line. 4. Valve areas are ample and all valves may be readily inspected. The manufacture of the Deming triplex pump is carried on under competent superintendence. None but the best materials and workmanship enter into their construction. Special tools and machinery are used, so that all working parts are interchangeable.



THE DEMING TRIPLEX ELECTRIC PUMP.

Electric Light Plant Burned.

The Wayne Electric Light Company's plant at Wayne, Delaware County, Pa., was destroyed by fire last week. The loss is $100,000; fully insured.

ELECTRIC RAILWAY PROGRESS IN NORTHERN OHIO.

There is now in contemplation an extension of the line from Elyria to Oberlin, a distance of seven miles, and from Oberlin to Wellington, a distance of 10 miles. This road would traverse a populous section with business requiring frequent interchange of visits on the part of the people residing thereabouts. It would be a feeder to the dairy interests of the country, and an early morning and evening milk train to the large dairies would be made to pay with little trouble. It is further reported that parties contemplate building an electric railroad from Mansfield to Wellington *via* Ashland. This would make a complete extension of the railroad system from Cleveland of at least 75 miles.

From Cleveland another suburban railroad line is projected to Lorain. It will parallel the lake shore west. Vineyards extend along the route and the business from that section would well repay the projectors. In addition to that much travel exists between Cleveland and Lorain. The latter is now an important tributary town to Cleveland and, of necessity, much commerce passes between the village and the metropolis.

From Elyria, which seems likely to become quite a center of electric transportation, it is proposed to build a railroad to Milan. At Milan connections would be made with the Sandusky & Norwalk Railroad and thus complete electric transportation would be provided from Cleveland to Sandusky, a point 60 miles west on the lake shore, opening all the island region to whatever advantage may exist by means of suburban commerce.

The Cleveland, Canton & Southern railroad (steam), running out of Cleveland, has felt the electric competition by reason of the fact that passengers could go to Akron by electric railroad and thence to points on the Cleveland, Canton & Southern cheaper than by the latter railroad direct. To meet it a notable reduction has been made in the price of round-trip tickets. That brings other steam railroads to the point where they must meet the same rate, and a general lowering of prices will follow on short railroads running south of Cleveland. The reduction consists in a two-cent per mile rate for round-trip tickets.

Two routes have been recently surveyed from Cleveland to Chagrin Falls, a busy little town in the southeastern portion of the county. It is very probable that roads will be built on both routes. They do not conflict in any way except at the termini. Plenty of business exists along the proposed lines, and there seems to be no particular reason why they should not make money. From Chagrin Falls it seems likely that at least one of these lines will be extended into Geauga County. The latter county is contiguous to Cuyahoga, and yet to reach it from Cleveland one must make an out-of-the-way detour of over 50 miles. The first electric railroad into that county is bound to be a paying investment.

The taking off of trains on the

Cleveland, Akron & Columbus Railroad, which has already been noted, has made the building of the Wooster, Medina & Cleveland Electric Railroad positive. The Cleveland, Akron & Columbus trains were almost the only convenience for the people of Wayne County to get to Cleveland. Now it takes nearly a day to reach Cleveland and quite as long to return. The building of an electric railroad will make a direct route to Wooster. The line will be about 35 miles long, and, as it passes its entire length through a section of the country that is dependent upon Cleveland as a supply center, seems to be sure of success. This line will enter the county seat of three counties. It passes through Creston, Seville, Chippewa Lake, Medina, Parma and Albion. Chippewa Lake is a Summer resort that has been popular in Cleveland but rather difficult of access. An electric railroad, well built and safely conducted, would pay for itself alone on transportation to that point.

In addition to the proposed suburban roads, all planned since a recent letter from Cleveland to the ELECTRICAL REVIEW, the city is now dicussing the proposition of an independent company desirous of laying tracks through the city streets. This new company will demand a three-cent fare. Of course there is opposition from the old companies. But the attempt of the city officials to impose certain taxes for track mileage and paving will have more effect in killing off the new railroad than the opposition of the older concerns. Its projectors maintain that they can carry passengers for a three-cent fare and make money, but can not, in addition to that, be taxed for improvements.

A rumor has been started that the two great street railroad corporations in Cleveland will consolidate. This is not generally believed, as it is well known that the officials of the "Little Consolidated," so called, have little in sympathy with the modes of management used by the "Big Consolidated." Together they would make one of the greatest systems of street railroads in the world.

Cleveland, Feb. 5. J. B. F.

An Electric Lighting Exhibit.

One of the most attractive and instructive exhibits at the electrical exposition to be held in New York will be that of the Edison Electric Illuminating Company of this city. The display will occupy a space of over 1,000 square feet and will comprise a complete demonstration of the applications of electricity for domestic purposes. The most improved methods of house lighting will be shown in detail; also cooking by electricity and electric heating.

This will be the first time that such a practical exhibition of the many uses to which electricity can be applied in the home has been made, displaying the various kinds of apparatus employed, all of which will be explained by those in charge of the exhibit.

"X RAY" PHOTOGRAPHY.

A CHAT WITH PROF. A. E. DOLBEAR ON THIS SUBJECT OF GENERAL INTEREST — HIS EXPERIMENT IN 1892, AND A FEW POINTS WHEREIN HE DIFFERS WITH PROFESSOR ROENTGEN.

Prof. A. E. Dolbear, of Tufts College, is a well known personality among electrical men through his various publications, and his standing in the scientific world is a prominent one.

In view of the great interest being displayed at the present time over Professor Roentgen's recent discovery of what he terms "X" rays, and the series of experiments now being carried on at our leading universities, along the lines laid down by him, it was thought Professor Dolbear might have something of interest to say on the subject. Your correspondent called on the professor a few days since at his home on College Hill, and was most pleasantly received.

While Professor Dolbear has not as yet had an opportunity of carrying on a series of experiments in this line since the results of Professor Roentgen's work has been made public, he is thoroughly well posted on the matter, and, indeed, had already demonstrated the possibility of photographing through opaque bodies as far back as 1892. His experiment at that time consisted in photographing a five-pointed iron star, by means of electric sparks, through an ordinary table top about an inch in thickness. The star was placed on a piece of photographic paper in the table drawer, and all light excluded from the room as much as possible. A Wimshurst machine was placed on the top of the table, and the sparks, penetrating the wood, produced a very fair outline of the star on the paper beneath it.

Having demonstrated the feasibility of the idea to his satisfaction, it was the professor's intention to follow the matter up by a series of more comprehensive experiments, but chancing shortly after to see an article in some magazine outlining a similar discovery by some other scientific man, and thinking he had been anticipated, he dropped it for more pressing work.

Professor Roentgen's experiments were made by the aid of a Crooke's tube, and his discovery is that, in addition to the phosphorescence produced by the transmission of the electric current through the rarified air in the tube, another radiation of a hitherto unknown nature is produced, which is capable of penetrating through all bodies, though not to the same extent.

These waves have been commonly called cathode rays, but Professor Roentgen states there is a difference, and designates them as "X" or unknown rays, containing different properties from those heretofore known. Professor Dolbear disagrees with him on this point, and states that in his opinion the same results could be obtained from any source of light.

Sun rays striking on any object are absorbed to a greater or less degree, and transformed from short to long rays, dependent upon the kind and thickness of the object.

The same principle holds good in gas or arc light rays in different proportions. Following out this line of argument, Professor Dolbear referred to an article on "Electricity and Photography" published over his signature in the *Cosmopolitan* of April, 1894, extracts from which, in the light of recent developments, may prove interesting. Professor Dolbear says:

"For a long time it was believed there were three different kinds of ether waves, known as heat, light and actinic rays. The latter were supposed to be the ones that produced the chemical action on photographic plates, while light consisted of rays of a different kind, capable of affecting the eye. It was discovered, however, that the same rays which can produce vision can also heat a body, and also do photographic work; and what any ray can do depends upon the kind of matter it falls upon, so that all rays have similar characteristic properties. This discovery makes it plain that there is no peculiar kind of ether waves which can be called light, as distinguished from other kinds of ether waves. What is called light is a physiological phenomenon, and has no existence apart from eyes. So well assured is this, that the serious proposal is made to banish the word 'light' from physics.

"The sensitive coating upon a photographic plate is an unstable chemical compound, which may be broken up by mechanical pressure, by heat, or by ether waves. The proper wave length for a given plate depends upon the nature of its surface. The tanning of the skin, the darkening of newly laid shingles, the coloring upon apples and other fruit, is a photographic process, as can be shown by shielding them from the sun's rays.

"It has long been known by photographers that pictures may be taken with ether waves much too long to be seen by the eye, if some other substances are used in place of the simple silver salts in common use.

"Since it has been shown that ether waves of all lengths have an electromagnetic origin, it has been apparent that all the effects of light can be duplicated with suitable electric apparatus. Lay a coin like a half-dollar on a plate of glass and let a few sparks from an electric machine fall on it. Remove the coin and the glass surface will not appear to have been affected; but if it be breathed on, the image of the coin will at once be seen, and that it is really engraved on the glass surface is evident, for it will not easily rub off. If a piece of photographic paper takes the place of the glass, it will have the imprint of the coin made upon it. It is not needful to have the sparks fall upon the coin, for, if it be enclosed in a dark box brought near to an electric machine having short sparks passing between its knobs, the ether waves set up by the latter will be sufficiently short to affect the photographic surface, which may be developed afterwards in the ordinary way.

"So it is actually possible to take a photograph of an object in absolute darkness with the ether waves set up by working an electric machine. Not much has yet been done in this direction, but it is a new clew to chemical possibilities, and one may confidently look forward to the time when the qualities and colors of surfaces of many things will be changed to suit the taste by an application of electric waves of suitable length to bring about the proper chemical reactions, and an electric machine may become a necessary adjunct to the apparatus of the photographer."

It would seem, after reading the above, that Professor Roentgen's discovery is not such a wonderful thing after all, so far as its principles are concerned, but lies chiefly in its adaptation to medical science through his accidental photograph of his hand, while working with a Crooke's tube in the course of experiments of an entirely different nature. Nevertheless, whether accidental or otherwise, it seems destined to open up a field of wide possibilities, and, now that a number of the scientific men of our leading colleges are taking the matter up, we may confidently look for a much wider range of knowledge on the subject in the near future. Professors Trowbridge, of Harvard, and Wright, of Yale, are exploiting the matter thoroughly, and Professor Dolbear has in contemplation a series of experiments from which we may look for good results. H. G. T.

Boston, Feb. 9.

Acetylene.

[*From the New York Times, February 4, 1896.*]

The New York *Times* sent to Dr. W. H. Birchmore, a recognized authority on the subject, to ask him for a plain, unvarnished statement of the merits and defects of this new illuminant, with the following result:

Dr. Birchmore has been engaged for the last six months in making an exhaustive study of carbide of calcium and its derivative, acetylene gas. He is an expert chemist, and his services were engaged by some capitalists to investigate the commercial practicability of acetylene gas. His conclusions, as summed up by him to the reporter, embrace the five following points:

1. Acetylene gas is useless for the purpose of reinforcing or enriching ordinary water gas.

2. Acetylene gas is at least equal, and probably superior, to sunlight for purposes of photography.

3. No burner now made will consume acetylene gas economically, irrespective of cost, and the invention of a burner with small enough apertures is the first serious obstacle to be overcome before the gas can be tested in comparison with ordinary illuminating gas.

4. Pure acetylene gas, when burned as an illuminant, makes bright colors brighter and dark colors darker; it might be used in a ball-room, never in a library or ordinary sitting-room. It has a flame which is essentially, though not apparently, lavender in color, and thus distorts daylight shades.

5. If carbide of calcium, from which acetylene is now obtained, can be produced at $45 a ton, or less, acetylene gas can be used commercially in a limited field.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Telephone and Telegraph Companies.

MONTREAL, P. Q.—The Montreal Electric Light Company is applying for incorporation, with a capital stock of $200,000. The applicants are Messrs. Louis Tourville, M. L. C.; Arthur Caron, Onesime Marin, Joseph Misael Fortier and Rodolphe Tourville.

GRAND RAPIDS, MICH. — The United States Electric Telephone Company has been incorporated; capitalized at $10,000. The business office is located in this city, but operations are now carried on mainly in Gratiot County, where short lines are being constructed between small towns. The stockholders and the number of shares are: Philip A. Leonard, four; Daniel Nei, five; Hugh E. Wilson, one.

FORT VALLEY, GA.—The Fort Valley Telephone Company will have its lines in about two weeks. There are already about 50 subscribers on the list.

COOLEYVILLE, MASS.—The American Telephone Company are placing more wires on the line through this village.

ORANGE, N. J. — The Orange Telephone Company has been incorporated by Edward P. Chamberlain, Merritt S. Middleton and Charles H. Johnson; capitalized at $250,000.

STEPHENSON, MICH.—A franchise for operating a new telephone station in this place was granted to R. E. Jennings and others by the City Council. Work on the new line shall commence within six months and be in operation within one year.

JOHNSON CITY, TENN.—The Nola Chucky Telephone Company is extending its line from this place to Elizabethton. The connection is already made to Milligan College.

ELIZABETH, N. J. — The New Jersey Trunk Line Telephone and Telegraph Company has been incorporated by William A. Topping, George. H. Bruce, of New York city; Benjamin A. Lawrence, of Elizabeth, N. J., and others, to build and operate lines in Essex, Passaic, Hudson and Union counties. Capital stock, $50,000.

BRIDGETON, N. J.—The Home Telephone Company has been organized in this place with a capital of $25,000. Dr. Joseph B. Sharp is president and Wallace C. Rice, secretary.

CANTERBURY, N. H.—A telephone company is soon to be formed. The stock is being rapidly taken. The line will run from East Canterbury to Boscawen to connect with the main line.

RED HOOK, N. Y.—The Red Hook Telephone Company has been incorporated to operate a telephone line from Barrytown to this place, Upper Red Hook, Annandale and Rhinebeck. Capital, $5,000. Directors, Peter H. Troy, D. O'Connell, of Barrytown; John Troy, Daniel W. Wilbur, of Red Hook, and Samuel K. Rupley, of Poughkeepsie.

NORTHFIELD, VT.—This place is soon to be equipped with a local telephone service.

UTICA, N. Y.—It may be stated on good authority that a company is being organized here to compete with the Central New York Telephone and Telegraph Company. This company will be known as the Utica Telephone and Telegraph Company. Its capital stock will be $25,000. It is claimed that the company will reduce the rental of 'phones in this city to $30 per year.

PEORIA, ILL.—The Central Union Telephone Company is about to put in several thousand dollars worth of new cable lines in this city. This is in line with the recent and extensive improvements which this company has been making, and will obviate cross talking, which sometimes is otherwise impossible to prevent in bad weather.

KANSAS CITY, MO.—The long-distance telephone lines between this place and Omaha will be opened for use February 10. This is the announcement made by Alonzo Burt, general manager of the Missouri & Kansas Telephone Company.

DOWN NECK, N. J.—The New York & New Jersey Telephone Company is perfecting arrangements for the establishment of two additional central stations, one to be located at this place and the other in Roseville.

OLDTOWN, ME.—The Telephone Dispatch Company has been organized with a capital stock of $9,000. The officers of the company are as follows: J. F. Gould, president; George T. Sewall, treasurer; J. F. Gould, George T. Sewall, James W. Sewall and C. B. Porter, directors. It is proposed to operate a telephone line through Oldtown, Alton, Lagrange, Howland, Hudson, Milford, Bradley, Greenfield, Great Works, Orono, Veazie, Bangor, Glenburn, Argyle and Edinburg.

New Electric Railways.

BALDWINVILLE, MASS. — Isaac Bourn and others, of Templeton, have petitioned the General Court to be incorporated as the Templeton Electric Street Railway Company. The plans are to build an electric railway between Templeton and Gardner.

PAWTUCKET, R. I.—The cars of the street railway company are to be immediately equipped with the Pfingst fender. The cars of the Interstate Consolidated Railway Company were recently equipped with fenders of this make.

SOUTHBRIDGE, MASS.—The directors of the Southbridge & Sturbridge Street Railway Company have accepted the franchise granted by the Sturbridge selectmen, and work will be begun early this Spring; cars are expected to be running in July.

NEWBURGH, N. Y.—A consolidation has been effected between the electric railway company of this place and the Orange Lake & Walden Electric Railway Company, under the title of the Newburgh, Orange Lake & Walden Railway Company.

MILWAUKEE, WIS.—The Milwaukee street railway system has been sold to Nelson Cromwell, of New York, for $5,000,000.

NEWTON, MASS.—The West End Street Railway Company has applied for a location for a double-track road from Oak Square to Nonantum Square.

CHICAGO, ILL.—The promoters of the Union loop have decided to push the construction of the road in Wabash avenue and also to begin work on the Fifth avenue portion as soon as circumstances will permit. It is now said that the line in Wabash avenue will be completed by April 1.

MONTREAL, ONT.—The contract for the construction of the Cornwall, Ont., Electric Railway has been signed. The road will be finished by June 1.

LOS ANGELES, CAL.—It is reported that the Main Street and Agricultural Park Railway has been sold to the Los Angeles Electric Railway syndicate, and that the transfer took effect on January 1.

RICHMOND, VA.—The Richmond Traction Company has awarded contract for the erection of its power house to W. A. Chesterman & Company.

WASHINGTON, D. C.—The Potomac Sefler Electro-Magnetic Railway Company has been incorporated by F. J. Patterson, George W. Mills, V. Griffin, M. L. Patterson and L. E. Patterson, all of Chicago; to build railways, boulevards, etc.

SKOWHEGAN, ME.—The Somerset Traction Company has been organized at this place for the purpose of constructing and operating a street railway with $75,000 capital stock, of which $30,000 is paid in. The officers are: President, R. B. Shepherd, of Skowhegan; treasurer, T. H. Anderson, of Skowhegan.

GRASMERE, N. Y.—The contract for the power house of the Midland Railroad at this place was awarded to Frank Rinchler.

WILLOW GROVE, PA.—There is a strong probability that the Old York road line of the Union Traction system will be extended from this place to Hatboro during the present year.

BATH, N. Y.—It is now stated that the proposed electric railway which is to connect this place and Hammondsport will be in operation by July 4.

MILWAUKEE, WIS.—The Milwaukee, Racine & Kenosha Street Railway Company has been incorporated by Thomas M. Kearney, Charles M. Dietrich and Richard T. Robinson, to build and operate a street railway system to be propelled by electricity or other power, from South Milwaukee, northerly through the village of Cudahy and the towns of Lake and Oak Creek and the city of Kenosha. Capital stock, $100,000.

POTTSTOWN, PA.—The Pottstown & Westchester Electric Railway Company will begin the construction of its electric road in the Spring, and they are now making arrangements for same.

SUTRO, CAL.—The Sutro electric road is now in operation. The following are the officers: President, Adolph Sutro; secretary, W. C. Little; superintendent, E. M. Van Frank; assistant secretary, T. Krauss; inspector, E. E. Sutro. Forty more arc lights will shortly be placed in the big Bath House.

New Manufacturing Companies.

EVANSVILLE, IND.—The Evansville & Terre Haute Chemical Works has been incorporated. The capital stock of the company is $25,000. The directors for the first year are J. L. Charles, Riley Charles, M. O. Miller, J. H. Schanck and R. C. Wilkinson.

ORANGEBURGH, N. Y.—Electrical Chemical Company has been incorporated by E. F. Leber, Albert Bernhard and Otto Porsch. Capital stock, $60,000.

BOSTON, MASS. — New England Electric Supply Company has been incorporated with Henry Cole, president; Bracey Curtis, treasurer; John S. Keenan and Henry N. West. Capital stock, $10,000.

CHICAGO, ILL.—The Turney Illuminating Company has been incorporated; capital stock, $100,000; to manufacture electrical appliances. Incorporators, Nelson C. Gridley, Sterling E. Sharon, John E. Halpenny.

SEATTLE, WASH.—The Current Motor Company has been incorporated by S. T. Kelsey, J. M. Tenney, F. H. Barron and others. Capital stock, $4,200.

TOPEKA, KAS.—The Comstock Motor Company has been incorporated for the purpose of carrying on a general manufacturing business. The capital is $100,000 and the directors are as follows: F. M. Comstock, G. J. Mulvane, C. C. Baker, D. W. Mulvane, L. H. Munn and D. A. Mulvane.

NEW WILMINGTON, PA.—A storage battery factory is to be started at this place.

PORTLAND, ME.—The New England Gramophone Company has been organized for the purpose of manu-

facturing and dealing in gramophones and other mechanical and electrical apparatus for conveying sound, with $250,000 capital stock, of which $500 is paid in. The officers are: President, A. J. Hodder, of Boston, Mass.; treasurer, F. J. Anthony, of Fall River, Mass.

PORTLAND, ME. — The Electric Equipment Company has been organized for the purpose of manufacturing and doing business in machinery and other apparatus, with $10,000 capital stock, of which $500 is paid in. The officers are: President, Harrison M. Davis, of Portland; treasurer, Harry R. Virgin, of Portland.

Electric Light and Power.

FLORISANT, MO.—John F. Ashbrook and others have obtained a franchise for an electric light plant.

SAN FRANCISCO, CAL.—The Abbott Electric Air-Cooling and Purifying Company has been incorporated by A. S. Brackett, H. W. Abbott, D. Gilbert and others. Capital stock, $1,000,000.

LITTLE ROCK, ARK.—The Little Rock Ice and Electric Company has been incorporated by Faucette Bros., to erect an electric light plant, etc. Capital stock, $100,000.

WASHINGTON, D. C.—The Potomac Light and Power Company has been incorporated for the sale of electrical current and electrical appliances of all kinds. Capital stock, $100,000, with the privilege to increase to $500,000.

OLYPHANT, PA. — Consolidated Light, Heat and Power Company has been incorporated, with William Mahon, treasurer. Capital stock, $12,000.

MARYVILLE, MO. — The electric light company's franchise has been revoked and its poles removed from the streets on account of alleged inefficient and unsatisfactory service.

NEW DOUGLASS, ILL.—The Town Board has appointed a committee to estimate the cost of an electric light plant to light the town.

HENDERSON, KY.—The City Council has accepted the plans of a Chicago firm for the erection of an electric light plant.

GREENFIELD, MASS.—The Greenfield Electric Light and Power Company held its annual meeting recently and elected the following officers: E. E. Wells, president; Charles H. Keith, clerk; A. J. Doolittle, superintendent and treasurer. Directors, J. W. Stevens, J. H. Sanderson, F. E. Wells, F. O. Wells and N. S. Cutler.

MONTREAL, CAN.—The Montreal Electric Light Company, Louis Tourville, Arthur Caron, Onesime and others, all of Montreal, are applying for incorporation. Capital stock, $200,000.

WINCHESTER, TENN.—J. L. Girton will probably establish an electric light plant. He desires estimates on an electric light plant of arc and incandescent lights for a town of about 2,500 inhabitants; boilers and engines to be included.

NASHVILLE, TENN.—The Cumberland Electric Light and Power Company held a meeting of directors and elected the following to serve for the coming year: T. M. Steger, Andrew Clark, Thomas Taylor, C. Steirly and D. P. Richardson.

LOCKPORT, N. Y.—A resolution has been introduced into the Common Council to raise the sum of $40,000 to put in a municipal lighting plant.

WOODBURN, ORE.—Citizens of this place will soon vote upon the subject of electric lights and waterworks to be owned and operated by the city.

HAMMONTON, N. J.—The Town Council has appointed a committee to find out the probable cost of waterworks and an electric light plant; the information to be laid before the annual town meeting in March.

TOPEKA, KAS.—The electric light plant is to be extensively improved.

GREENWICH, OHIO.—An electric light plant is to be established. S. J. Brooks, city clerk, will give information concerning same.

MITCHELL, IND.—An electric light plant will probably be constructed.

BROWNWOOD, TEX.—John G. Lee will erect an electric light plant.

BARNWELL, S. C.—Poles for electric wires are being put up along the streets, and the office will be much more central and convenient than now.

BLUEMOUND, ILL.—J. H. Culver, of Detroit, is interested in the construction of the proposed electric light.

DE KALB, MO.—Steps are being taken to construct an electric light plant.

CHARLESTON, S. C. — The new cotton mill to be erected by the Young Men's Business League will be equipped with an electric light plant. They are now in the market for the necessary machinery.

HENDERSON, N. C.—The Henderson Cotton Manufacturing Company will install an electric light plant.

BRANFORD, CONN.—An electric light plant is to be erected, and at a town meeting held recently it was voted to increase the tax for constructing same.

Increase of Capital Stock.

DETROIT, MICH. — The capital stock of the Edison Illuminating Company has been increased to $100,000 for the purpose of building another station in the eastern part of the city.

INDIANAPOLIS, IND.—At a meeting of the stockholders of the Commercial Electric Company, of this city, it was decided to increase the capital stock from $20,000 to $40,000.

ROCKDALE, TEX.—The Rockdale Improvement Company has amended its charter, increasing capital from $25,000 to $50,000, and obtaining privilege to erect electric light plant, etc.

PACIFIC, MO.—The Pacific Electric Company has increased its capital from $5,020 to $6,520.

Business Troubles.

RICHMOND, VA.—E. W. Little and W. P. Smith have been appointed receivers for the Old Dominion Electrical Constructi n Company upon motion of the complainant, the Interior Conduit and Insulation Company.

LITERARY.

For upwards of two years the publishers of *McClure's Magazine* have been quietly gathering material and pictures for a new life of General Grant. They believe that they have made a larger collection of portraits of Grant (many of them rare), and other pictures relating to his life, than has ever been made before. The biography will bring out the real Grant in the same vivid, thorough and interesting manner as Lincoln is presented in the "Life" now running in *McClure's*. They have been fortunate in securing the co-operation of Col. F. D. Grant, who has most of his father's papers.

PROPOSALS FOR LIGHTING THE CITY OF KEOKUK, IOWA, WITH ELECTRICITY.

Sealed bids will be received by Sumner T. Bisbee, Clerk of Council of the city of Keokuk, Iowa, until 12 o'clock noon of Friday, February 21, 1896, for lighting the city of Keokuk with 140, more or less, arc lights, in accordance with specifications now on file with, and copies of which can be had of, Sumner T. Bisbee, Clerk of Council of Keokuk.

Said contract to be for the term of five years from and after May 3, 1896.

Said bids to be opened and acted upon at a special meeting of the Council to be held Friday, February 21, 1896, at 7.30 P. M.

The Council reserves the right to reject any or all bids.

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KINDRED INTERESTS

The attention of all central station men is invited to the weekly changes in the announcement of the Weston Electrical Instrument Company.

The Sioux City Electrical Supply Company, of Sioux City, Iowa, will immediately enlarge its plant in order to keep up with the demand for its products.

The American Carbon Company, Noblesville, Ind., are sending out neat blotters advertising their product. The capacity of this company's plant is 150,000 carbons a day.

The C. J. Field Company, consulting and constructing engineers, of New York, have changed their offices from the Havemeyer Building to the Taylor Building, 39 Cortlandt street.

"The Pocket List of Railroad Officials," published quarterly by the Railway Equipment and Publication Company, 326 Pearl street, New York, is a handy volume to have around. It is correct, complete and compact.

The Deming Company, Salem, Ohio, manufacturers of pumps, have favored the staff of the ELECTRICAL REVIEW with a number of neat diaries for 1896, containing much valuable information and particulars of the company's products.

Any one interested in plumbago crucibles should write to the Joseph Dixon Crucible Company, Jersey City, N. J., for a copy of an excellent pamphlet entitled "How to Use Plumbago Crucibles," by John A. Walker, vice-president of the company.

The Knowles Steam Pump Works, 93 Liberty street, New York, have just issued a very creditable special catalogue of electric power pumps. A great variety of this kind of apparatus is illustrated and described in a manner likely to interest any one concerned with pumps.

Stern & Silverman, of Philadelphia, have issued an elegant volume, bound in cloth, entitled "The Superiority of Electric Storage Traction." The information it contains should be of great value to any one interested in electric traction. The book also contains a number of illustrations of plants installed in various parts of the country by Stern & Silverman.

The Electric Appliance Company, of Chicago, have just prepared a special catalogue of the "Paiste" specialties, listing a complete line of Xntric switches, Paiste sockets, cut-outs, etc., together with a special net price-list on these goods. They will be glad to send this catalogue on application. It makes quite a valuable list for reference, as considerable of the material has not been previously catalogued.

Lighting Elevated Cars.

Senator Coggeshall recently offered a bill at Albany, N. Y., providing that on and after June 1 next every corporation operating an elevated railroad in New York city shall equip every car used for the transportation of passengers with the most approved system of lighting passenger cars now in use upon railroads, either by electricity or gas, of not less than 18 candle-power, and any such corporation is prohibited from using, after June 1, kerosene or coal oils as a means of lighting its passenger cars. There is a penalty for violation.

KIND WORDS.

AN OPINION BACKED WITH CASH.

TO THE EDITOR OF ELECTRICAL REVIEW:

Herewith enclosed please find draft for one year's subscription to your valuable paper. Respectfully,

F. S. B.

Central Union Telephone Co.

La Salle, Ill., Feb. 1.

A Guide Book and Flowers.

The ELECTRICAL REVIEW acknowledges receipt of a copy of "Philadelphia: Old and New," from Mr. H. A. Cleverly, of Philadelphia, also receipt of one of his very artistic calendars for 1896. We thank Mr. Cleverly for his remembrance, and trust that the flowers so conspicuously pictured in his calendar may ever be found along his pathway.

Edward Muzzy has been appointed superintendent of the electric light company of Stafford Springs, Ct.

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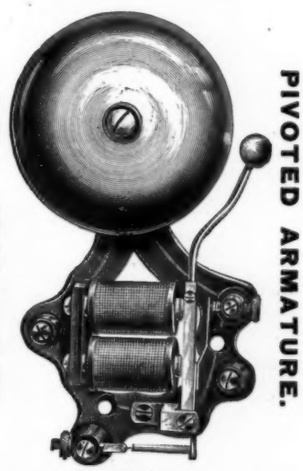

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ELECTRICAL PATENTS

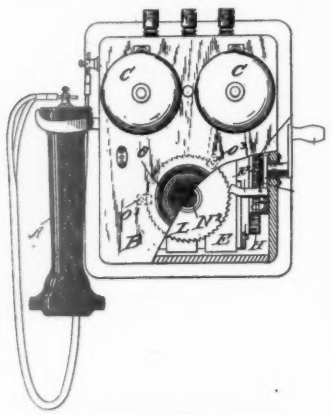
ISSUED FEBRUARY 4, 1896.

553,831 Secondary battery; A. E. W. Boucher, Prilly, Switzerland.

553,838 Signal box; F. W. Cole, Newton, Mass.—Consists of a signaling train, a signal lever, combined with a variable stopping device for the train, comprising a lever adapted to engage and hold the train, a holder for said lever movable quickly in one direction and restored intermittingly.

553,839 553,840 Signal box; F. W. Cole, Newton, Mass.

553,843 Telephone; S. A. Dinsmore, Chicago, Ill.—A telephone having a transmitter containing granulated carbon combined with means for agitating such carbon

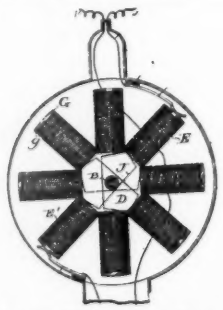


No. 553,843.—TELEPHONE.

with means for giving the call signal to the telephone with which communication is sought, and connections between them whereby the agitating mechanism is responsive to the call signaling mechanism.

553,844 Insulating joint; W. O. Duntley, St. Louis, Mo.—Consists of the upper and lower attaching parts and the interposed insulator, said upper part having a drip cone for delivering water of precipitation into the insulator and said insulator having a drip cone for directing said water past the lower attaching part.

553,847 Electric transformer; W. K. Freeman, Fort Wayne, Ind.—Co-operating inductorium plates having oppositely-extending arms, the arms on one plate having their inner edges inclined and the arms on the opposite plate having their outer edges inclined, whereby when the two are brought together the inclined surfaces co-operate and wedge together without lateral dis-



No. 553,911.—REGULATING SOCKET FOR INCANDESCENT LAMPS.

placement of either plate with relation to the other.

553,857 Electric light switch; H. W. Lawrence, Denver, Colo.

553,858 Spring supporting ear for trolley wires; C. A. Lieb, New York, N. Y.—A trolley car comprising a bolt portion adapted to secure the ear to the insulator, a body part, a sleeve adapted to secure the trolley wire in place and a slot in the body part between the sleeve and bolt portion.

553,873 Signal apparatus; J. J. Ruddick, Richmond, Ind.

553,890 Electric programme clock; H. T. Zeidler, Berlin, Ger.—Consists of the minute hand of a clock and its supporting shaft, of a programme plate provided with a spiral guide, a contact-piece carried by the said hand and automatically slidable toward the said shaft when clear of the said guide and a stop carried by the said hand and operating to arrest the said contact-piece opposite the inner end of the guide.

553,900 Electrical whistle-controlling device; A. E. Colgate, New York.—A whistle, a whistle-operating magnet and circuit, an automatic circuit-maker for sounding the whistle at intervals, and means always in condition to act connected to the circuit for both throwing the automatic circuit-maker out of use (when in use) and for sounding the whistle at will.

553,901 Automatic current regulator; S. C. Currie, New York, N. Y.—Consists of a circuit embracing a secondary battery and a resistance device for controlling the amount of current passing through the circuit, and means comprising an expansion rod for varying the resistance offered to the current.

553,911 Regulating socket for incandescent lamps; A. B. Hendricks, St. Mary's, Ill.—Consists of a socket to receive the lamp, a hub provided with radially-extending coils of varying resistance and stationary contact fingers arranged to close the circuit successively through the resistance coils as they are revolved.

553,919 553,921 Electric arc lighting; G. R. Lean, Cleveland, Ohio.

553,920 Electric arc lighting system; G. R. Lean, Cleveland, Ohio.

553,923 Apparatus for electric welding; H. Lemp, Lynn, Mass.—Consists of two transformers supplying heating currents to the same work, alternating current sources connected respectively to the primaries of said transformers and adapted to supply alternating currents of different frequency.

553,927 Electric trolley; N. Muslar, West Boylston, Mass.—Consists of a flanged trolley wheel, a yielding pivoted lever held in said wheel with its end projecting within the flange of said wheel, and a spring applied to said lever to maintain it in position.

553,953 Electric railway; A. Casazza, Hoboken, N. J.—Consists of an electrically operated switch, a trolley and line wire, spring pressed plates on the trolley arms, the conducting strips opposite the said plates, and an electric circuit including a generator, contact plates, conducting strips, and an electrically-operated switch.

553,957 Telegraphy; P. B. Delany, South Orange, N. J.

553,960 Electrical igniting device; W. Kaiser, Vienna, Austria-Hungary.

553,964 Registering apparatus for telephones; F. Quatram, Pankow, Ger.

553,965 Electrician's screwdriver; J. Reece, Pulaski, N. Y.—A handle for the screwdriver composed of material which is a non-conductor of electricity and formed with an annular pocket adapted to have a supply of wire wound round the same, the shank of the screwdriver permanently embedded in the handle and a locking cap.

553,977 Adjusting attachment for telephone signal bells; C. F. Dunderdale, Chicago, Ill.

553,979 Electric railway; F. C. Esmond, Brooklyn, N. Y.—A case for magnetic circuit-closing devices, consisting of a base of insulating material located, when the case is in position for use, below the street level, and a dome-shaped cap or top of conducting material connected to such base and projecting above the street level.

553,980 Electric railway. 553,981 Circuit controlling device for electric railway systems; F. C. Esmond, Brooklyn, N. Y.

554,036 Telephone apparatus; C. J. Schwarze, Adrian, Mich.

554,043 Electric battery; D. S. Williams, Philadelphia, Pa.

554,063 Commutator for magneto-electric machines; J. C. Henry, Westfield, N. J.—A commutator for a magneto-electric machine having the radial arms of its alternate segments surrounded with insulation.

554,074 Electrical circuit-closer; L. B. Miller, Elizabeth, N. J.

554,080 Automatic switch; J. F. McElroy, Albany, N. Y.

554,083 Electric time and signal recorder; C. E. Ongley, New York, N. Y.

554,089 Electric carriage lamp; P. H. Quinn, New York, N. Y.—An electric light attachment for carriage lamps, consisting of a socket, means for retaining said socket in the cup or cone of the candle-holder of the lamp, a spring-cushioned lamp-holder supported on said socket, an incandescent lamp inserted into the lamp-holder, and conducting wires connecting said lamp with the source of electricity.

554,097 Signaling apparatus; J. D. Taylor, Chillicothe, Ohio.

554,102 Underground system for electric railways. 554,103 Electric conductor and contact device therefor. 554,104 Underground system for electric railways; W. P. Allen, Chicago, Ill.—Consists of the yokes and the insulating chairs having ribs thereon, a flexible casing resting on said ribs, and a support within said casing wholly between said ribs, adjustable fastening devices extending through said support, casing and chairs.

554,112 Telegraph key; W. Deats, Amawalk, N. Y.—A transmitting key-lever, a rotary operating knob thereon, a circuit switch having one contact mounted upon the knob or knob spindle, and the other contact mounted on said lever.

554,123 Time recorder; D. Hepp, Chicago, Ill.

554,124 Electric battery; C. J. Hirliman, Fort Lee, N. J.

554,135 Telephone system; W. A. Houts, Parker, S. D.—A switch comprising a barrel having circumferential grooves, contact strips crossing the grooves and bent to enter a portion of the grooves, wheels turning on the barrel, and contact arms carried by the wheels to engage the contact strips.

554,130 Fuse holder and lightning arrester; H. A. Lewis, Norristown, Pa.—A binding post provided with a slot and spring clamp consisting of a U-shaped plate, one end member of which is held in the said slot.

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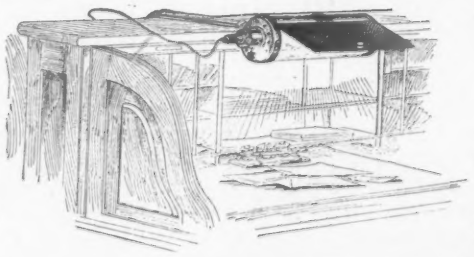

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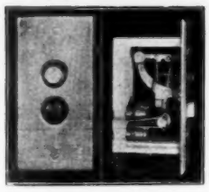

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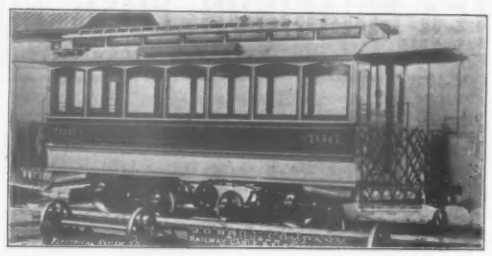

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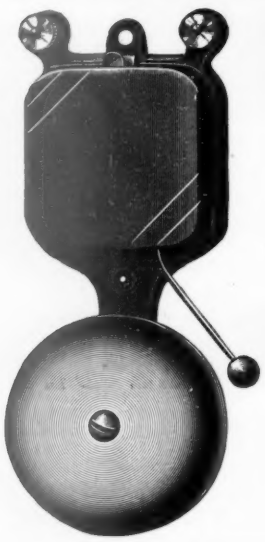

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